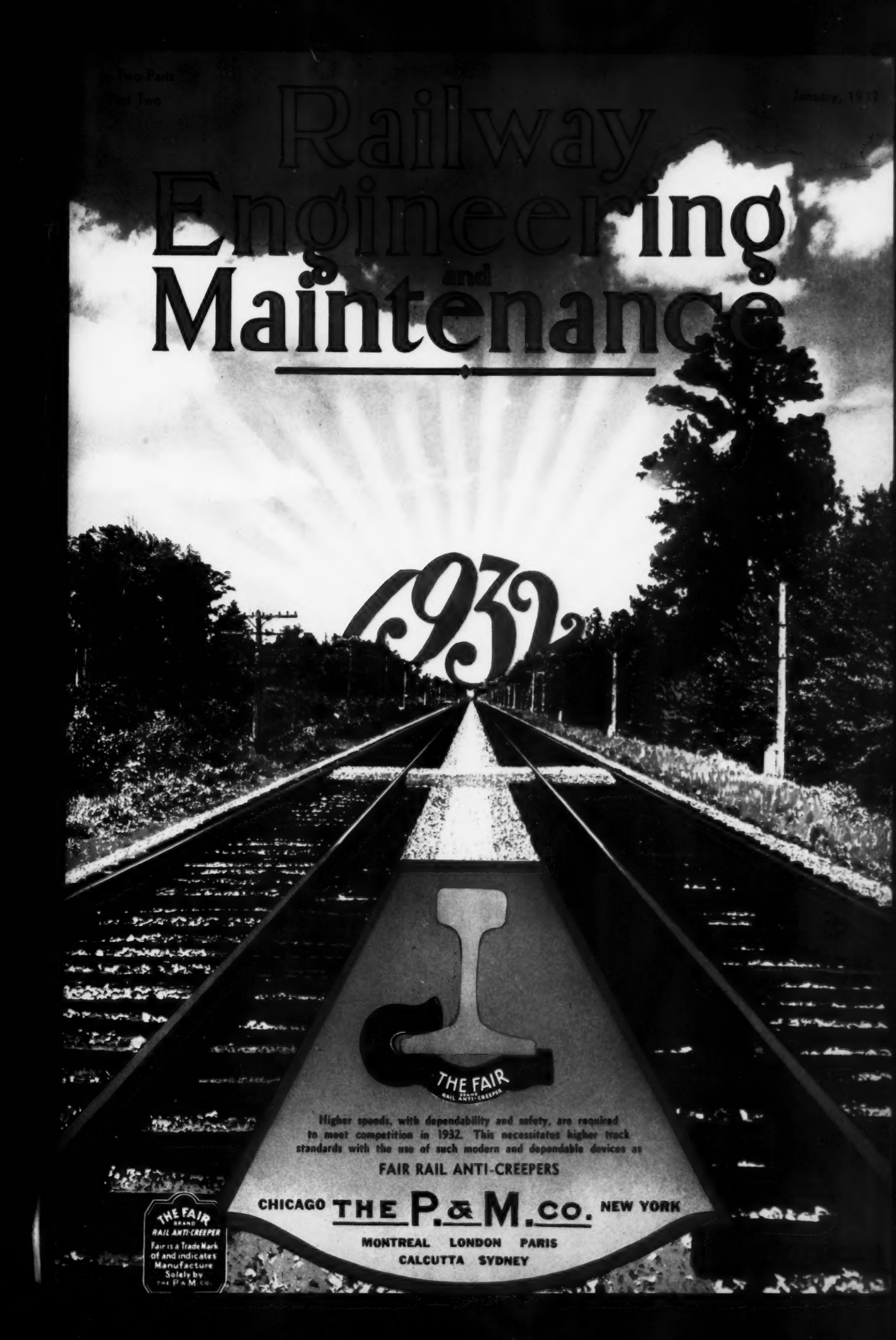
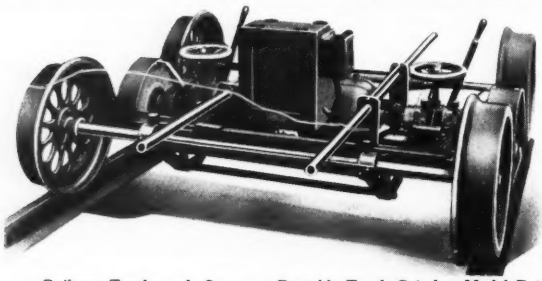
In Two Parts—Part Two

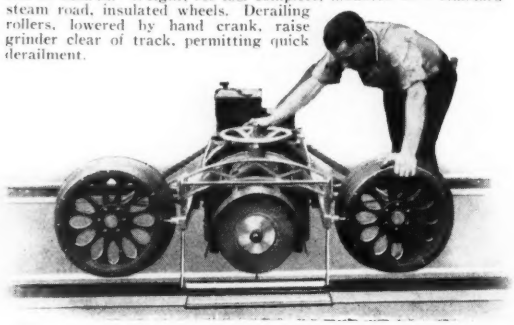
January, 1932

Railway Engineering and Maintenance

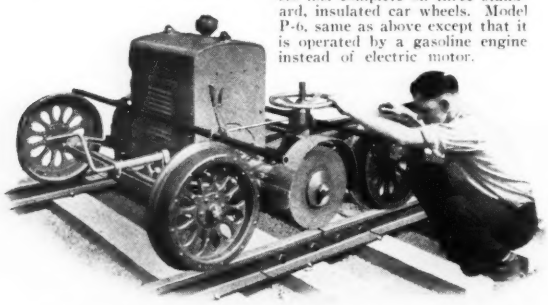

1932
THE FAIR
BRAND
RAIL ANTI-CREEPER
Higher speeds, with dependability and safety, are required to meet competition in 1932. This necessitates higher track standards with the use of such modern and dependable devices as
FAIR RAIL ANTI-CREEPERS
CHICAGO THE P. & M. CO. NEW YORK
MONTREAL LONDON PARIS
CALCUTTA SYDNEY
THE FAIR
BRAND
RAIL ANTI-CREEPER
Fair is a Trade Mark of and indicates Manufacture Solely by
THE P. & M. CO.



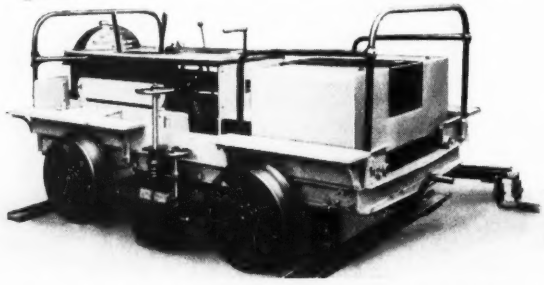
Railway Track-work Company Portable Track Grinder, Model P-2
Two grinding heads operating independently on either rail. Electric motor driven, 5 h.p., 2850 r.p.m. Grinding wheel, 12-in. diameter, operates at 9000 surface ft. per min. Grinding wheel feed regulated by hand wheel. Grinds gauge line or outside of rail as desired. Weight, 900 lbs. complete, mounted on 4 standard steam road, insulated wheels. Derailing rollers, lowered by hand crank, raise grinder clear of track, permitting quick derailment.



Railway Track-work Company Portable Track Grinder, Model P-3
Grinding wheel operates on either rail. Single throw hand lever operates a jack enabling operator to swing machine for grinding opposite rail. Grinding wheel feed regulated by hand wheel. Grinds gauge line or outside of rail. Electric motor driven, 3 h.p., 3000 r.p.m. 12-in. grinding wheel operates at 9500 surface ft. per min. Quickly adjusted roller permits speedy, one-man derailing. Weight, 530 lbs. complete on three standard, insulated car wheels. Model P-6, same as above except that it is operated by a gasoline engine instead of electric motor.



Railway Track-work Company Portable Track Grinder, Model P-4
Operated by 12 h.p., 4 cyl. gasoline engine, 1500 r.p.m. Ingenious hand crank starter makes it impossible to injure operator. Weight complete, 1200 lbs. In all other respects similar to Model P-2 grinder.



Railway Track-work Company Portable Reciprocating Grinder, Model P-7
Propelled and operated by 40 h.p. Ford Industrial gasoline engine. An economical machine for surfacing joints in new track. Grinds by reciprocation instead of rotation. Produces a smooth surface, maintains original rail contour, removes minimum metal. No danger of damaging rail. Two grinding blocks, on each rail make 200—3½-in. strokes per min. Special rollers and frame for quick derailing. Weight approximately 3600 lbs. complete, with four standard car wheels, insulated.

Now choose

from this complete line of machine tools for track grinding

For grinding of joints built up by welding, for finishing joints in new track.

—designed specifically for steam road track maintenance

—by the world's headquarters for track grinding equipment

—based on more than a decade of experience in this particular field.

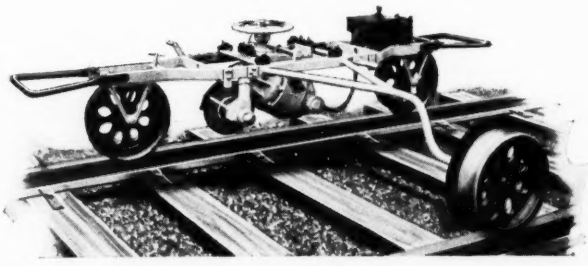
—proven in service as efficient, economical and satisfactory in every respect.

As a first step see descriptive bulletins covering any or all of these machines.

Railway Track-work Co.

3132-48 East Thompson Street Philadelphia

Descriptive literature on request



Railway Track-work Company Portable Electric Track Grinder, Model P-8
Two standard car wheels resting on one rail, carry entire machine. Outrigger rests on opposite rail. Unshipping outrigger permits placing grinder on neutral ground to pass train. 3 h.p. Electric motor, 3450 r.p.m., operates 10-in. grinding wheel at 9000 surface ft. per min. Wheel adjustable laterally and vertically. May be reciprocated with a 16-in. stroke. Flexible shaft carries 6-in. grinding wheel for beveling joints after welding. Weight 400 lbs. —355 lbs. without the outrigger.

1663

RAILWAY ENGINEERING AND MAINTENANCE
Published monthly by Simmons-Boardman Publishing Co., at 2200 Port Washington Road, Milwaukee, Wisconsin. Subscription price: United States and Mexico, $2.00; Canada, $2.50 including duty; foreign countries, $3.00 a year. Single copy, 35 cents. Entered as second class matter February 14, 1931, at the postoffice at Milwaukee, Wisconsin, under the Act of March 3, 1879.

Alphabetical Index to Advertisers, Page 70

WHAT

is the Purpose of a Tie Plate

Is it not to Protect Ties from Mechanical Wear

Then why is not Design the Most Important Requisite of a Tie Plate

REAL tie protection is determined by tie plate design. Nothing else. All other qualifications are secondary. Service in track is what counts and that service should be measured by the ability of the plate to protect ties against mechanical wear.

The Lundie is the one tie plate that holds track to perfect gauge without the use of destructive projections which ordinarily ruin ties and defeat their very purpose. Its design prevents mechanical wear and insures maximum return on cross tie investments.

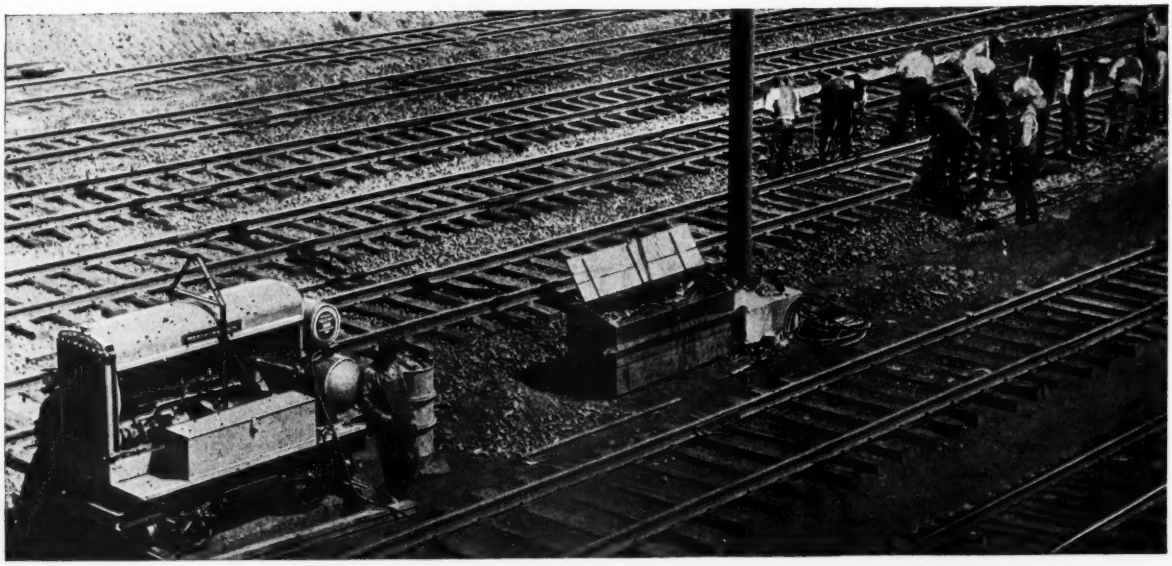
You can have this real tie protection at no increased cost.

The Lundie Engineering Corporation

285 Madison Avenue, New York
59 East Van Buren Street, Chicago

LUNDIE TIE PLATE

Grooming the Roadbed of the *Broadway Limited* . . .



THE roadbed of the *Broadway Limited,* and other crack flyers of the Pennsylvania Railroad, is groomed with the help of Worthington *Air King* Compressorcars. In the Pennsylvania's fleet of roadway apparatus there are 17 of these cars. Each unit, of 220 cu. ft. capacity, is sufficient to operate ten tie tampers . . . power enough for an entire section gang.

In the Worthington Compressorcars, a mechanical drive transmits power direct from the engine to the wheels . . . eliminating an air motor and reducing the burden on the compressor. Full power enables the car to climb steep grades with ease.

The famous Worthington Feather Valve Compressor is direct-connected to a Continental Red Seal Gasoline Engine . . . and the electrically-welded frame is unconditionally guaranteed against breakage for the life of the unit.

Additional details are described in Catalog W-850-B1. Write or ask for it at the nearest district office. Ask, too, for the facts about Worthington air tools and pumps.

WORTHINGTON PUMP AND MACHINERY CORPORATION

Works: Harrison, N. J. Cincinnati, Ohio Buffalo, N.Y. Holyoke, Mass.

Executive Offices: 2 Park Avenue, New York, N.Y.

GENERAL OFFICES: HARRISON, N. J.

District Sales Offices and Representatives:

ATLANTA	CHICAGO	DALLAS	EL PASO	LOS ANGELES	PHILADELPHIA	ST. PAUL	SEATTLE
BOSTON	CINCINNATI	DENVER	HOUSTON	NEW ORLEANS	PITTSBURGH	SALT LAKE CITY	TULSA
BUFFALO	CLEVELAND	DETROIT	KANSAS CITY	NEW YORK	ST. LOUIS	SAN FRANCISCO	WASHINGTON

Branch Offices or Representatives in Principal Cities of all Foreign Countries

COMPRESSORS
Portable and Stationary
ROCK DRILLING EQUIPMENT
Rock Drills
Contractors Air Tools
Drill Steel and Accessories
Automatic Heat Treating Machines
Forging Furnaces
MULTI-V-DRIVES
PUMPS
Centrifugal...Steam...Power Rotary...Deep Well
FEEDWATER HEATERS
CONDENSERS and Auxiliaries
METERS
Water...Grease Oil...Gasoline
DIESEL ENGINES
GAS ENGINES
CHROMIUM PLATING

Literature on request

WORTHINGTON R-85

• ARE YOU THE MAN Whose "YES" or "NO" Keeps the "Main Line" Open?

POOR pipe often blocks the main line just when traffic must move over a division. Delays and danger due to pipe failures pour the red ink on a company's ledgers, *through overtime.*

Yet the high costs of maintaining a poor piping system, or of preventing tie-ups while pipe repairs are being made, can easily be avoided.

All that is necessary is to specify Reading PUDDLED IRON PIPE. Then you have taken all the precautions that any man can take. For Reading PUDDLED Iron Pipe is pipe made from the one material that has withstood the tests of time—the only tests of pipe value that have any true meaning—in tens of thousands of installations for thousands of uses over four generations of service.

Ask for facts regarding the best Reading PUDDLED Iron Pipe for the specific service you need. All Reading Pipe is made from time tested PUDDLED Iron, but worthwhile savings can be made by using the right kind of Reading Pipe for particular uses. Write us today about your problems.

READING IRON COMPANY, Philadelphia, Pa.

READING PIPE
PUDDLED IRON
Since 1836

Science and Invention Have Never Found A Satisfactory Substitute for Genuine Puddled Iron

There IS NO detour from main line track!

Whether there's one or a hundred trains a day—regardless of the condition of the track—there is no detour from the main line. It must be used.

Rail renewals, ballasting and surfacing are thus a necessity—more of a necessity today than ever in order that railroad trains may maintain high speeds with safety, thus meeting the demands of shippers and the competition of other methods of transportation.

To tremendously reduce the cost of an adequate track maintenance program, many of the leading railroads have standardized on track machinery developed by Nordberg, for all track maintenance jobs. Such power driven machinery as Power Jacks, Tie Adzing Machines, Spike Pullers, Rail Drills and Grinders, are producing better track at lower cost.

Let us tell you where you can check up on the tremendous savings accomplished by these machines.

Nordberg Rail Drill

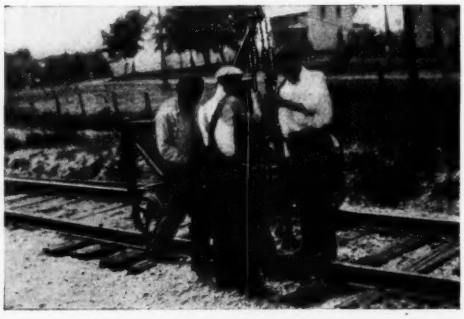
Nordberg Adzing Machine

RAILWAY EQUIPMENT DEPARTMENT

NORDBERG MANUFACTURING CO.

MILWAUKEE - - - WISCONSIN

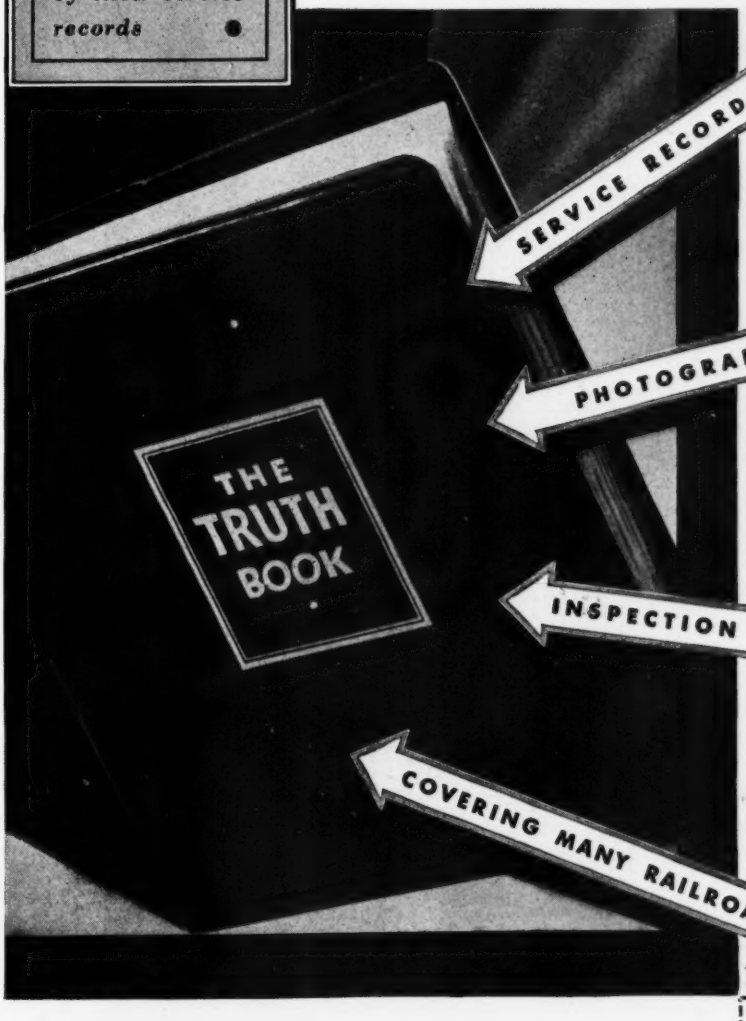
Nordberg Power Jack



Nordberg Spike Puller

CULVERT BUYERS *will be Startled* BY THE TRUTH BOOK ON CULVERTS

FACTS and photos comparing all kinds of culverts by their service records



Now you can get at the truth about culvert service quicker than ever before. This book contains the most striking collection of information on culverts ever made. It also contains authentic service records of all kinds of culverts.

Hundreds of officials and engineers have taken inspection trips in order to get the facts about culvert service. Railroad buyers and engineers have been guided by these facts in specifying and buying the right culvert for the job.

Now everyone can get at these facts quickly in "The Truth Book." No need now to listen to "conversations" or "claims" about culverts.

Get these facts which will show you how to save thousands of dollars on your road.

Use the Coupon

• • • for prompt action, clip and mail today

Gentlemen: I would like to see THE TRUTH BOOK.

Name.....

Title.....

Road.....

Address.....

City.....

REM 1

ARMCO CULVERT MANUFACTURERS ASSOCIATION, *Middletown, Ohio*

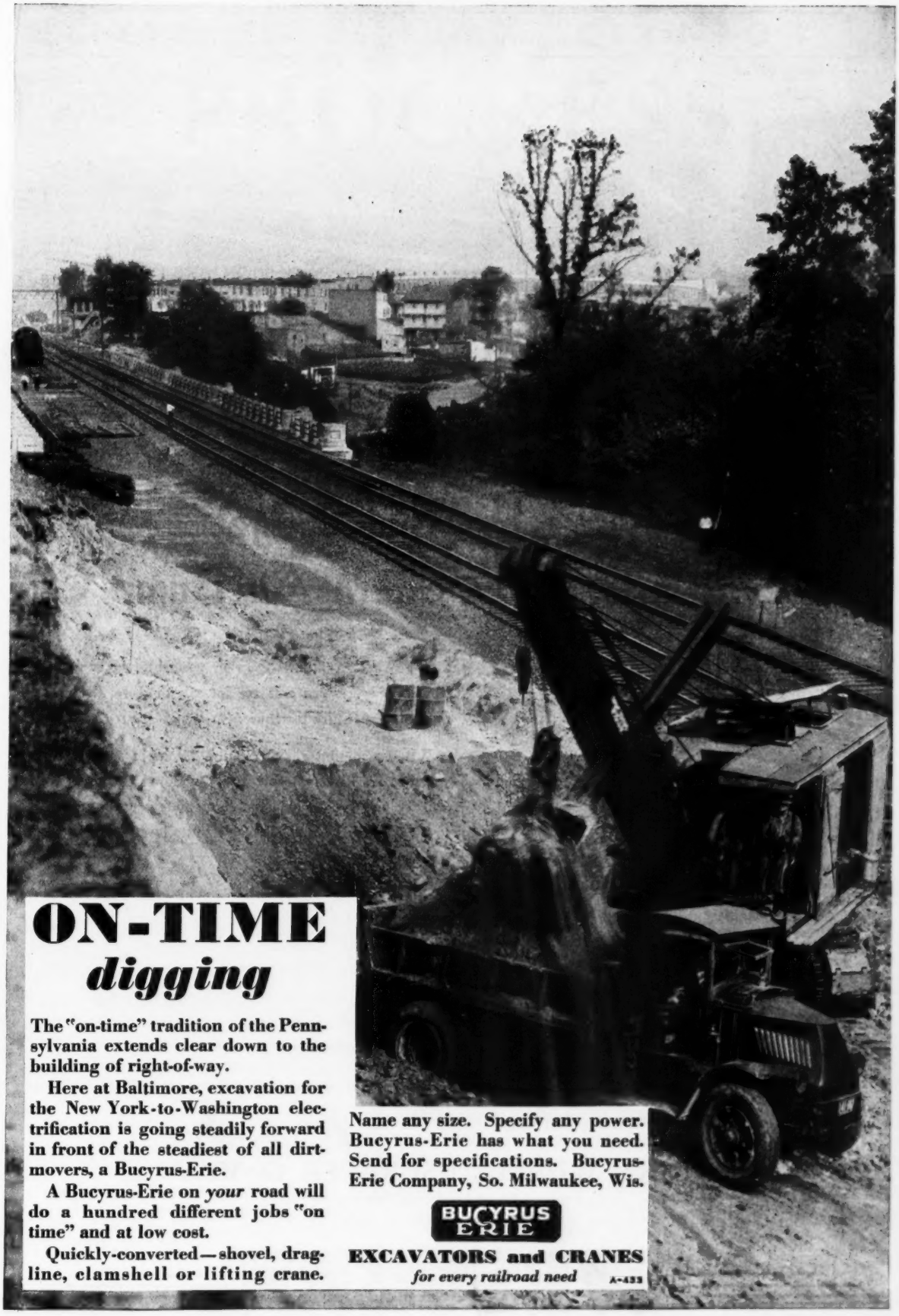
—VERONA—
INSPECTORS' LEVEL AND GAUGE
for MAINTENANCE OF WAY DEPARTMENT OFFICIALS

An Accurate Instrument for Supervisory Track Inspection
Which is most essential at the present time

—It is Light Weight—Five Pounds
—It is a Track Level
—It is a Track Gauge with Guard Rail Lug
—It is a Master Gauge for Testing Other Gauges
—It is a Wheel Gauge for Measuring Distance Back to Back of Wheels

[PARTS ARE SOLID BRASS NICKEL PLATE]

WOODINGS-VERONA TOOL WORKS [Verona, Pa.] "Since 1873"



ON-TIME *digging*

The "on-time" tradition of the Pennsylvania extends clear down to the building of right-of-way.

Here at Baltimore, excavation for the New York-to-Washington electrification is going steadily forward in front of the steadiest of all dirt-movers, a Bucyrus-Erie.

A Bucyrus-Erie on *your* road will do a hundred different jobs "on time" and at low cost.

Quickly-converted—shovel, dragline, clamshell or lifting crane.

Name any size. Specify any power. Bucyrus-Erie has what you need. Send for specifications. Bucyrus-Erie Company, So. Milwaukee, Wis.

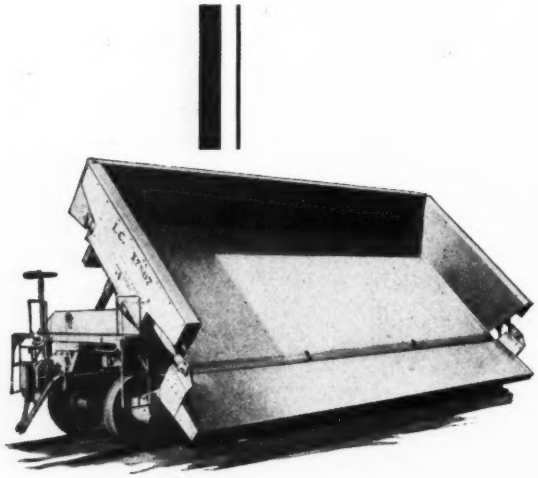
BUCYRUS ERIE

EXCAVATORS and CRANES

for every railroad need A-433

This striking picture of the Cincinnati Union Terminal work shows a loaded train of thirty-six Western 30-yard Drop Door Dump Cars on the way from the gravel pit at Milepost 16 to Mill Creek bottom.

When You Make Up That Budget Insist on Western Air Dump Cars



Get Western Dump Cars in your budget somehow. Remember Western cars are for sale or lease, the rental to apply on future purchase.

When a single train can haul 1400 cubic yards at high speed as shown in the picture; can dump the great load quickly and get away again immediately without delaying traffic, even on a hot track, your low handling costs will look mighty well in a report.

Put Western Air Dump Cars in your 1932 budget. You need them to keep your costs down. More than 100 superb Western cars, 30 cubic yards capacity, on the Cincinnati Union Terminal work, have enabled 5,000,000 cubic yards of grading to be completed six months ahead of schedule and with a corresponding lowering of costs.

May we send you full construction details? Write today.

WESTERN WHEELED SCRAPER COMPANY

Dump Cars and Grading Equipment

AURORA, ILLINOIS, U. S. A.

WESTERN

ELECTRICITY IS THE MODERN POWER

PROGRESS

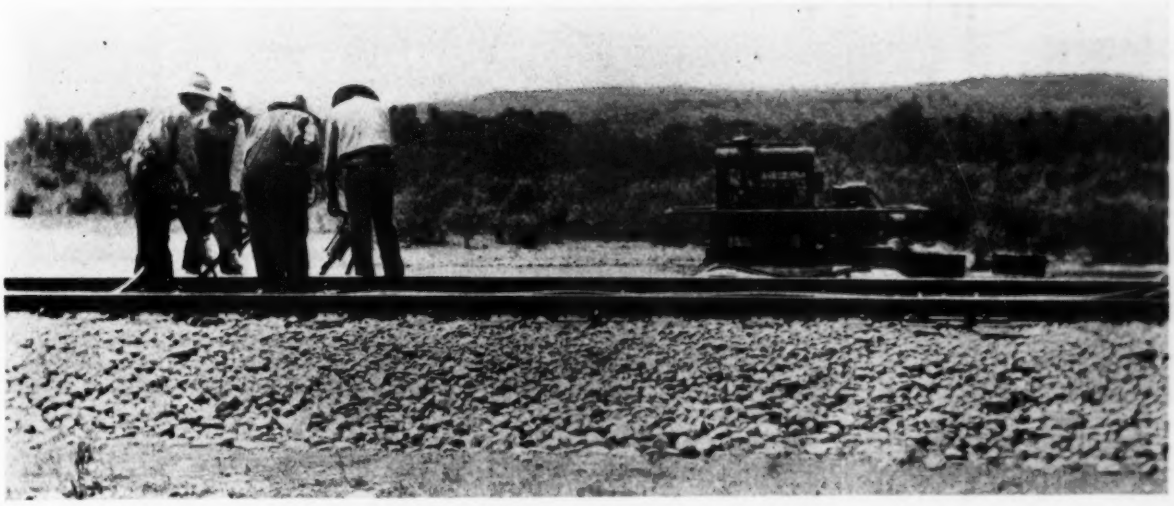
OBSOLETE METHODS
HAND PICK TAMPING

	TIME SHEET	Reg. Time	O. T.
1	John Jones, Foreman	8	hrs.
2	Gandy Dancer, Laborer	8	"
3	Gandy Dancer "	8	"
4	Gandy Dancer "	8	"
5	Gandy Dancer "	8	"
6	Gandy Dancer "	8	"
7	Gandy Dancer "	8	"
8	Gandy Dancer "	8	"
9	Gandy Dancer "	8	"
10	Gandy Dancer "	8	"
	Total	80	"

MODERN METHODS
SYNTRON ELECTRIC TAMPING

	TIME SHEET	Reg. Time	O. T.
1	John Jones, Foreman	8	hrs.
2	R. Syntron, Laborer	8	"
3	R. Syntron "	8	"
4	R. Syntron "	8	"
5	R. Syntron "	8	"
6	R. Syntron "	8	"
	Total	48	"

This Expense Saved by → SYNTRON ELECTRIC TIE TAMPERS



The railroads, to meet competition, must not only maintain, but improve track surface to provide higher speed track. Hand tamping can not possibly meet this crisis.

The use of Syntron Electric Tampers will provide more uniformly and better tamped track and at the same time reduce labor costs.

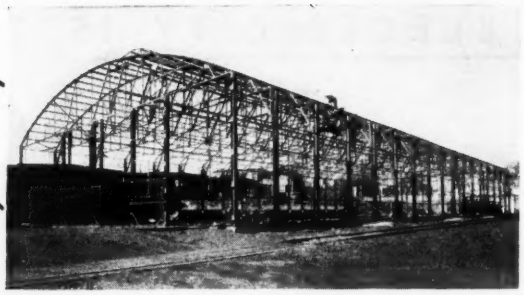
Would a saving of $6.90 per day per gang be of any value today? A saving of $1380 per year per outfit.

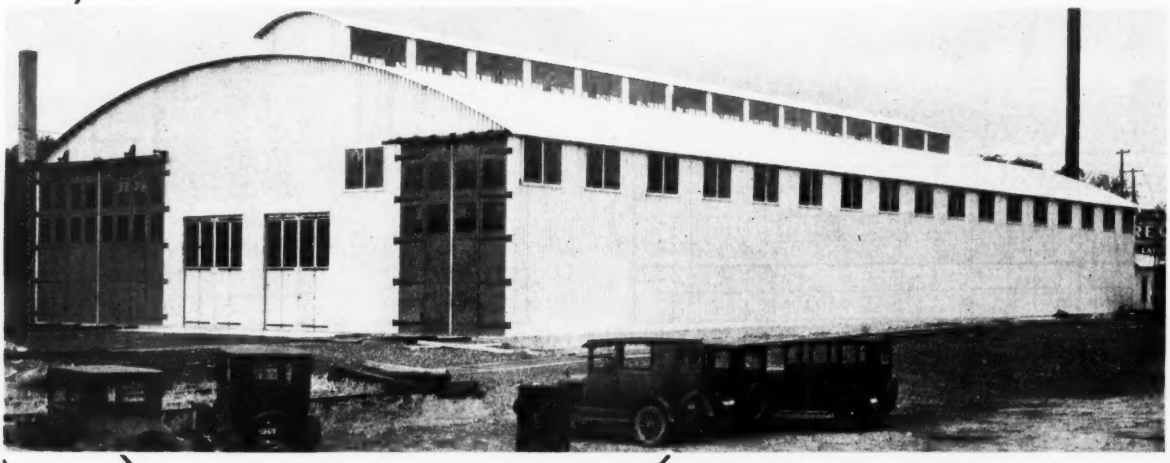
BUILT IN 2, 4, 6, 8, 12, 16 TOOL OUTFITS

SYNTRON CO. PITTSBURGH, PA.

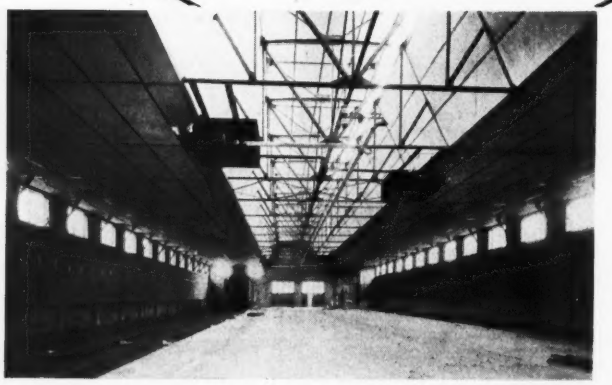
MADE ENTIRELY OF STEEL

BUTLER

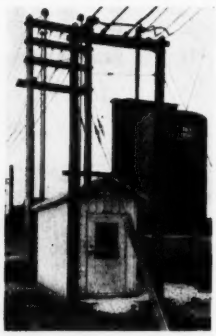




READY-MADE
STEEL
BUILDINGS



At the top right is a photograph of the structural steel frame which carries the C. B. & Q. Fruit House. Its members are designed to give the greatest strength per pound of steel and fabricated in units such as to facilitate quick assembly. The large photograph shows the finished building with the panel corrugated wall and roof sections bolted into a finished exterior. The special Butler panel corrugation multiplies sheet steel strength fourfold over ordinary corrugating. The interior view above the inside insulation is accomplished with Nu-wood, a commercial wall board. Insulation and heating facilities are such as to maintain a 50 degree temperature in coldest weather.

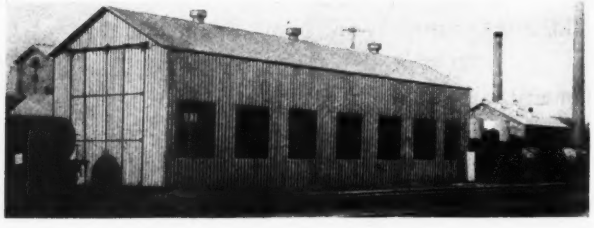


Fruit Houses . . . Car Repair Shops . . . Truck and Bus Garages . . . Material Depots and Treating Plants . . . Scale Houses . . . Track Car Houses . . . Machine Shops . . . Signal Towers and Transformer Houses . . .

These . . . and many other railway structures . . . are now ready-made of steel . . . fit into railway economy programs better than any other fire-safe type of construction.

Standardized unit design facilitates quick assembly on location, enlarging, taking down and re-erection . . . complete, ready-made materials in orderly arrangement promotes quick installation without interruption . . . permanence is inwrought in both materials and structural design.

The standardized unit design of Butler Ready-made Steel Buildings is flexible. Butler engineers gladly collaborate to incorporate the ideas of railway engineers to fulfill particular requirements.



BUTLER MANUFACTURING COMPANY

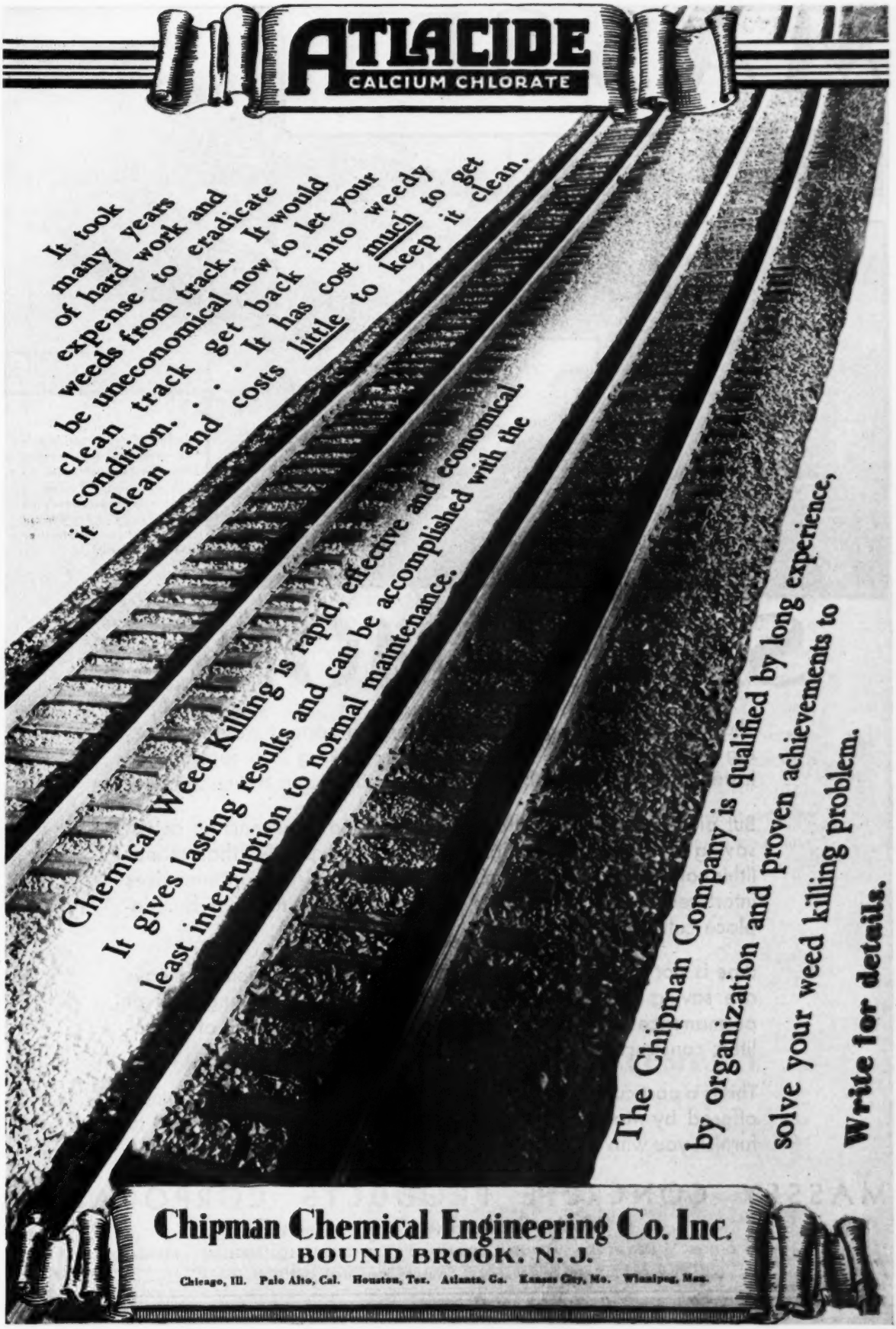
1247 Eastern Ave. KANSAS CITY, MO.

MINNEAPOLIS, MINN. 947 Sixth Ave., S. E.

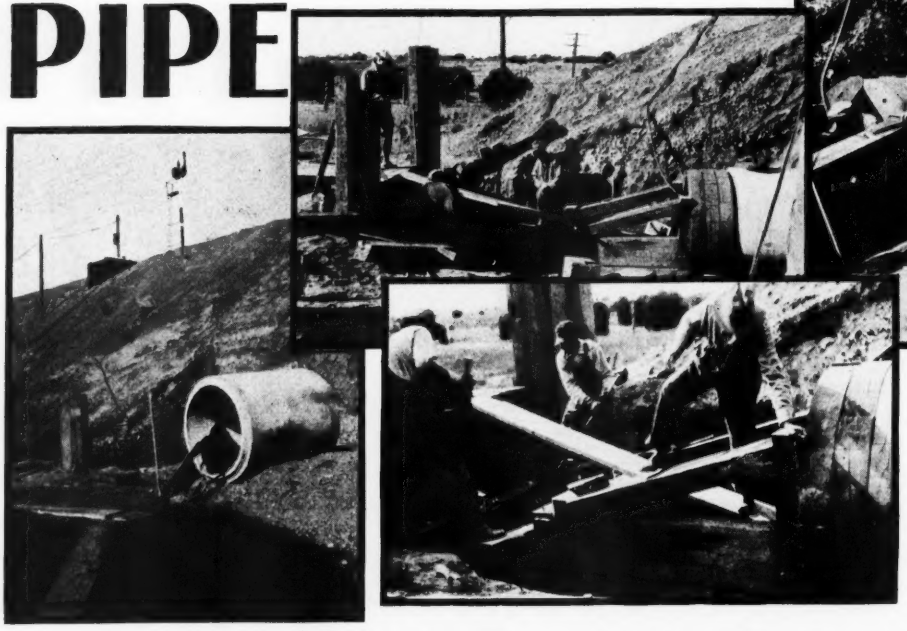
Send complete information on Butler Ready-made Steel Buildings, particularly a building approximately .....ft. by..... ft., to be used for .....

Firm Name.....

Address .....


ATLACIDE
CALCIUM CHLORATE
It took many years of hard work and expense to eradicate weeds from track. It would be uneconomical now to let your clean track get back into weedy condition. . . It has cost much to get it clean and costs little to keep it clean.
Chemical Weed Killing is rapid, effective and economical. It gives lasting results and can be accomplished with the least interruption to normal maintenance.
The Chipman Company is qualified by long experience, by organization and proven achievements to solve your weed killing problem.
Write for details.
Chipman Chemical Engineering Co. Inc.
BOUND BROOK, N. J.
Chicago, Ill. Palo Alto, Cal. Houston, Tex. Atlanta, Ga. Kansas City, Mo. Winnipeg, Man.

MASSEY PIPE



Jacking offered a considerable saving on this particular project. Note the height of the fill, the size of the pipe, and the simple jacking rig by which nearly 100 lineal feet of pipe was installed without disturbing the track or the embankment.

SAVES MONEY

The job pictured above illustrates one important way of reducing culvert costs with Massey pipe—by jacking it through the fill instead of installing it by the tunnel or the open trench method.

But almost every installation of Massey pipe represents an actual saving in money. In addition to being less expensive than monolithic construction it is convenient to install at any season, minimizes interference to traffic, and is fully as permanent as a built-in-place culvert.

Pipe is not the only Massey product on which American railways are saving money. Massey cribbing offers a retaining wall of permanence and stability at a cost well below that of monolithic construction.

This is a particularly good year to take advantage of the economies offered by Massey products. Our nearest office will be glad to furnish you with detailed information or cost data for your budget.

MASSEY CONCRETE PRODUCTS CORPORATION

Peoples Gas Building, Chicago, Illinois

SALES OFFICES: NEW YORK ATLANTA CLEVELAND ST. LOUIS LOS ANGELES MINNEAPOLIS

310 Dominion Square Building, 1010 St. Catherine Street, West, MONTREAL, QUEBEC

REM 1 Gray

OXWELDING *and* CUTTING

for all-around economy

THE money-saving applications of oxy-acetylene welding and cutting are so numerous and so varied that scarcely any one man in a railroad organization can know them all.

Realizing this, railroads which are getting the most out of the oxy-acetylene process have turned for its efficient utilization to a group of specialists in railroad welding and cutting practice.

This group consists of the engineers, supervisors, and service operators of The Oxweld Railroad Service Company, an organization which has served American railroads for nineteen years. Training railroads' own employees in the best methods of welding and cutting, overseeing their work, and supplying them with the best materials and facilities, this service has proved to be of increasing value to the majority of Class I railroads, year after year.

THE OXWELD RAILROAD SERVICE COMPANY

Unit of Union Carbide and Carbon Corporation

UCC

NEW YORK, Carbide and Carbon Building
CHICAGO, Carbide and Carbon Building

No. 37 of a series

Railway
Engineering and Maintenance
SIMMONS-BOARDMAN PUBLISHING COMPANY

105 WEST ADAMS ST.
CHICAGO, ILL.

December 28, 1931

Subject: 1931-1932

Dear Reader:

As we close the old year and enter the new, I and my associates want to express to you the deep sense of gratitude that we feel for your loyal co-operation during the year which has just closed. The last twelve months have been trying ones for all of us—with their problems, their uncertainties and in not a few instances, their bitter disappointments.

Yet as we look back over these weeks, we find much to be grateful for —to you who have commended our work by continuing your subscriptions so universally, to those who have contributed of your experience to our editorial pages that others might benefit thereby—and especially to those resolute manufacturers whose continued patronage of our advertising pages has made possible the maintenance of our editorial service on its normal plane. It is these recollections that will remain after the trials of 1931 have been forgotten.

As the old year passes into oblivion, the thought that is uppermost in the minds of all of us, I am sure, is of the new year and what it has in store for us. Especially, will it bring the end of the present period of stress? I think that it will. Like one in a forest, we can go only half way through before we begin to come out.

I feel definitely that we are now on the way out and have been so for several weeks—and further, that 1932 will see us well on the return to normalcy. Especially do I feel so about the railways, for with the readjustments now in progress, their earnings should be largely restored and this will permit them to do much-needed work on their tracks and structures, thereby causing them to re-enter the markets for materials and equipment and to bring back many employees now on furlough or on short time.

For these various reasons, we wish you a happy and prosperous new year.

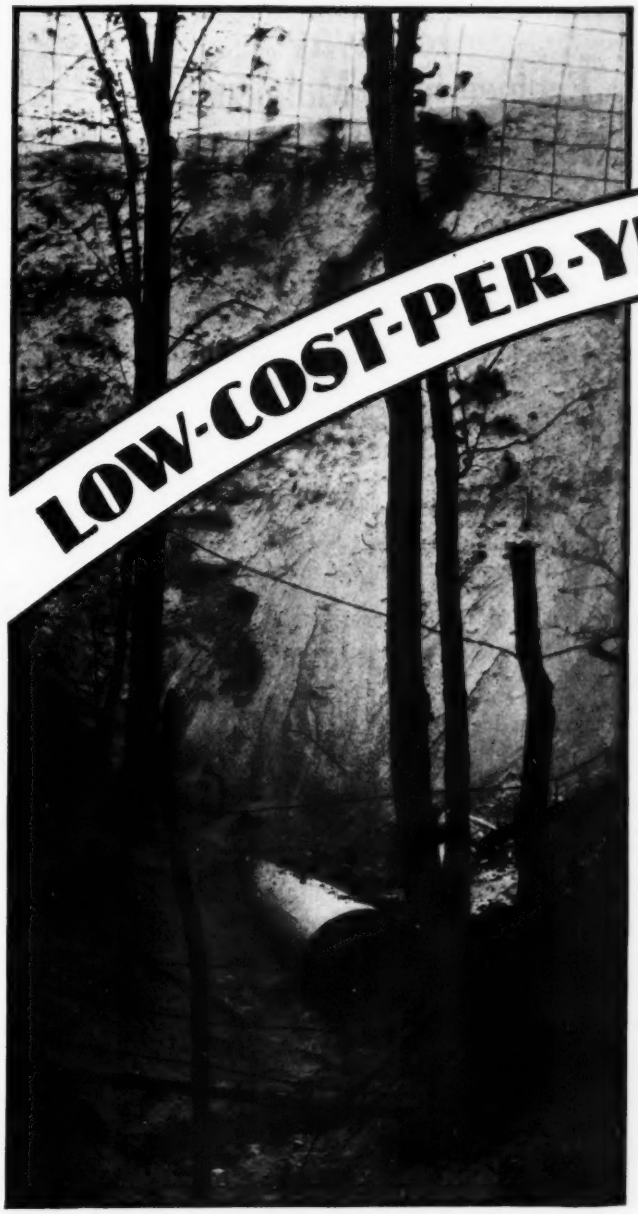
Yours truly,

Elmer T. Howson

ETH*JC

Editor.

MEMBERS: AUDIT BUREAU OF CIRCULATIONS AND ASSOCIATED BUSINESS PAPERS, INC.



LOW-COST-PER-YEAR SERVICE

GOHI Corrugated Culvert installed under fifty feet of earth and rock fill, demonstrating its tremendous flexible strength.

THE past twenty years have demonstrated that for low-cost, trouble-free railway drainage, GOHI Corrugated Culverts are outstanding. They are relatively low in first cost. Light in weight, they greatly reduce shipping, handling and installation costs. No heavy machinery is needed for installation; a smaller ditch is sufficient. Flexible, they do not crack, break, or sections pull apart when subjected to freezing, settling fills, or vibration of heavy trains. Made of rust-resisting Pure Iron-Copper Alloy, they reduce cost through longer service. Normally, they outlast the roadbeds under which they are laid. Write today for full details.

GOHI CULVERT MFRS., Inc.
Newport, Kentucky

GOHI FABRICATORS

DENVER STEEL & IRON WORKS CO., Denver, Colo.
A. N. EATON, METAL PRODUCTS, Omaha, Nebr.
FEENAUGHTY MACHINERY CO., Portland, Oregon
TENNISON BROTHERS, Texarkana, Ark.
CAPITAL CITY CULVERT CO., Madison, Wis.
CENTRAL CULVERT CO., Ottumwa, Iowa
ROANOKE SALES CORP., Roanoke, Va.
ST. PAUL CORRUGATING CO., St. Paul, Minn.
TENNISON BROTHERS, Oklahoma City, Okla.
A. N. EATON, METAL PRODUCTS, Billings, Mont.
THE NEWPORT CULVERT CO., Newport, Ky.
THE PENNSYLVANIA CULVERT CO., Philadelphia

GENUINE OPEN HEARTH IRON
GOHI
TRADE MARK
PURE IRON - COPPER ALLOY
REG. U.S. PAT. OFF.

(Meet copper-bearing pure iron requirements in all accepted specifications for corrugated metal culverts.)

GOHI
PRONOUNCED "GO-HIGH"
Corrugated CULVERTS

Published on the last Thursday preceding the month of issue by the

SIMMONS-BOARDMAN PUBLISHING COMPANY

2200 Port Washington Road, Milwaukee, Wis.

Editorial Office
105 West Adams Street, Chicago

NEW YORK
30 Church Street

CLEVELAND
Terminal Tower

WASHINGTON, D. C.
17 and H Streets, N. W.

SAN FRANCISCO
215 Market Street

Samuel O. Dunn, *Chairman of the Board*; Henry Lee, *President*; Lucius B. Sherman, *Vice-President*; Cecil R. Mills, *Vice-President*; Roy V. Wright, *Vice-President and Secretary*; Frederick H. Thompson, *Vice-President*; George Slate, *Vice-President*; Elmer T. Howson, *Vice-President*; F. C. Koch, *Vice-President*; John T. DeMott, *Treasurer*.

Subscription price in the United States and Possessions and in Mexico, 1 year, $2; 2 years, $3; Canada, including duty, 1 year, $2.50, 2 years, $4; foreign countries, 1 year, $3; 2 years, $5. Single copies, 35 cents.

Member of the Associated Business Papers (A. B. P.) and of the Adult Bureau of Circulations (A. B. C.).

Entered at the postoffice at Milwaukee, Wis., as mail matter of the second class.

Printed in U. S. A.

Railway Engineering and Maintenance

NAME REGISTERED U. S. PATENT OFFICE

JANUARY, 1932

Editorial - - - - - - - - - - - - 23
A general review of 1931 with particular reference to roadway and structures and the expenditures made

How One Road Controls Drifting Sand - - - - - - 26
Problems of desert areas overcome by leveling and oiling right of way, sprinkling track and constructing drift fences

Bore Only Eight Holes in Erecting Trestle - - - - - 30
Frame bents for creosoted structure of Santa Fe were assembled at the treating plant where all timbers were preframed

Roads Report Results of Track Inspections - - - - - - 32
Brief synopsis of the ratings established and awards made by several railways that have announced their findings

Using Tie Tampers as Ice Cutters - - - - - - - - 34
Many switches are kept clean in winter on Canadian Pacific by the use of standard track equipment

Automatic Skimmers Remove Oil - - - - - - - - 35
R. L. Holmes describes separating chambers that have proved thoroughly effective on the Texas & Pacific

Specialized or General Work Gangs? - - - - - - 37
Committee report discusses relative merits of "combined" and "separate" gangs for bridge and building maintenance

A New Form of Track Organization - - - - - - - 39
H. R. Clarke outlines the changes effected by the Burlington in its plan for supervising track maintenance

Sanitation at Outlying Points - - - - - - - - - 41
Southern Pacific installs septic tanks and filter beds where public sewers are not available

What's the Answer? - - - - - - - - - - - 43

New and Improved Devices - - - - - - - - - 51

New Books - - - - - - - - - - - - 54

News of the Month - - - - - - - - - - 55

ELMER T. HOWSON
Editor

WALTER S. LACHER
Managing Editor

NEAL D. HOWARD
Eastern Editor

GEORGE E. BOYD
Associate Editor

M. H. DICK
Associate Editor

F. C. KOCH
Business Manager

A REMARKABLE ECONOMY THAT ALSO ASSURES ADDED SAFETY

●

Without any extra expense the use of Racor Samson Switch Points insures:

●

1. No more short life of switch points. Samson Switch Points maintain necessary smooth wearing surfaces to engage wheel flanges for a safe and smooth passage and, under heavy traffic, they give many times the life of common standard points. (See Figure 1 and descriptive matter on following pages.)

2. No more broken down switch points and danger of wheel flanges mounting on jagged wearing surfaces. (See Figures 1 and 6, and descriptive matter on following pages.)

3. No more need of switch point protectors that make for rough riding traffic and damage to wheel treads and flanges; occasion for their expense is eliminated.

4. There is probably no recent innovation in trackwork that will give a greater return on its investment than the Racor Samson Switch.

A number of large railroad systems in the U.S.A. have installed Samson Switches with proof of the above claims.

Similar switch point planing has been used in Continental Europe for the last several years and a number of the large railroad systems there have adopted it universally. These roads find that standard knife blade switch points are no longer economical especially when something very much better and safer can be purchased without extra cost.

While covered by United States patents, most of the manufacturers specializing in trackwork in this country, have licenses to furnish the Samson Switch.

●

RAMAPO AJAX CORPORATION

SPECIALISTS IN TRACKWORK MATERIALS

•REAL NEWS•

RACOR SAMSON SWITCH

LONG LIFE

1. The remarkable length of life given by Racor Samson Switch Points is due to the inverted "V" shape that fits against the undercut stock rails as shown by illustrations on the opposite page. The amount of metal removed from the lower corner of the head of the stock rail (similar to Head Free Rail) permits an equivalent added amount of metal to the inner side of the switch point head. This permits a heavily tapered section switch point without encroaching on the gage line. The gage line is maintained on the stock rails throughout their length and the switch points conform to standard practice on the gage side. The result is, as the switch points wear back, they wear smoothly, the undercut stock rails house and prevent the wear from extending into the heavy portion of the switch point. This explains how the Samson Switch Points provide considerable more metal for wear, and also why they may be worn back a considerable portion of their length and still maintain smooth wearing surfaces to engage wheel flanges for a safe and smooth passage. Actual practice has shown that Samson Switch Points have given up to ten times the life of the common knife blade type of switch points, with the Samson Switch Points still in a good and safe condition.

SAFETY... NO BREAKING DOWN

2. The inverted "V" shape of the Samson Switch Points as shown in Figure 1 assures them against breaking down under any traffic condition. On the other hand, standard knife blade switch points (Figure 6) after comparatively short service in heavy traffic become wafer thin and, under heavy wheel pressure, must break down, leaving jagged wearing surfaces with danger of wheels mounting same.

ELIMINATES SWITCH POINT PROTECTORS

3. The use of the Samson Switch eliminates the occasion for switch point protectors. The thick portion of the Samson Switch Points (Figure 1) is housed in the side of the stock rail, and there can be no tendency for the wheel to climb when engaging the point when new, or after being worn back by long and heavy service.

Switch Point Protectors, especially those in quite common use in this country, that deflect wheels in a very short distance in advance of or on the switch points, encroaching inside of gage line, put a tremendous strain on the wheel flanges and, when they are worn, there is nearly as much tendency for the wheels to climb the protector as to be diverted laterally.

The Samson Switch costs less than a standard knife blade switch equipped with most types of switch point protectors.

EXTENSIVE USE

4. Though switch point planing in accordance with the Samson Switch has not been used to any large extent in the U. S. A., the advantages of its use in American traffic has been well demonstrated by a number of large railroad systems that have installations, and its extensive use throughout this country is assured. This is in line with similar switch point planing extensively used throughout Continental Europe.

No railroad official in charge of maintenance or operations can afford to overlook the advantages of Samson Switch Installations, especially at all important traffic switch locations.

GENERAL—The only added expense in installing the Racor Samson Switch is the machining of one side of the stock rails against which the switch points throw. This machining is in line with the shape of the well-known Head Free Rails. (See Figures 2, 3, 4 and 5.)

The extra cost of the stock rails furnished with this switch, machined as illustrated, adds only about 5% to the cost of the switch. This small extra expense of installation is negligible when compared with the increased service life over the old type of points.

Switch points, switch plates, rods and fittings cost no more than present equipment, and can be made to the same detail as present standards with the exception of the point planing on the stock rail side. The point planing on the gage side is preferably made to present A.R.E.A. Standards (see Figure 3) or it can be made to any existing standard desired.

While the machining of the stock rail is similar to the shape of the Head Free Rail, it is nearer vertical, not so much of the lower corner of the head being removed. For best results, the slope on the head of the Head Free Rail requires a little machining so that the angle at the top of the switch point will be maintained as illustrated.

The length of the machining of the stock rail shown (Figure 2) is just a little longer than the distance of the fit of the switch point against the stock rail. This machining makes it desirable that the location of joints in advance of switch points and the length of stock rails be uniform so that machined stock rails carried in stock for spare would fit in any location.

To prevent creepage of rail either standard heel blocks can be used at the heel of the switch, or, if the floating heel joint is preferred, a heel block may be installed back of the heel joint bolting the lead rails to the stock rails, or the stock rails can be equipped with some other effective anti-creeper.

The stock rail can be machined for the entire length if desired except for splice bar portion at the ends. But for locations where a large percentage of the heavy traffic is trailing off the turnout point, it is better to have full head rail close in advance of the trailing point.

The installation of new switch points against worn stock rails is not economical as it shortens the life of the switch points, which results in frequent renewals of both switch points and stock rails with common knife blade switches. Samson Switches lasting many times longer than common knife blade switches offer further economy by eliminating the necessity of frequent renewal of stock rails.

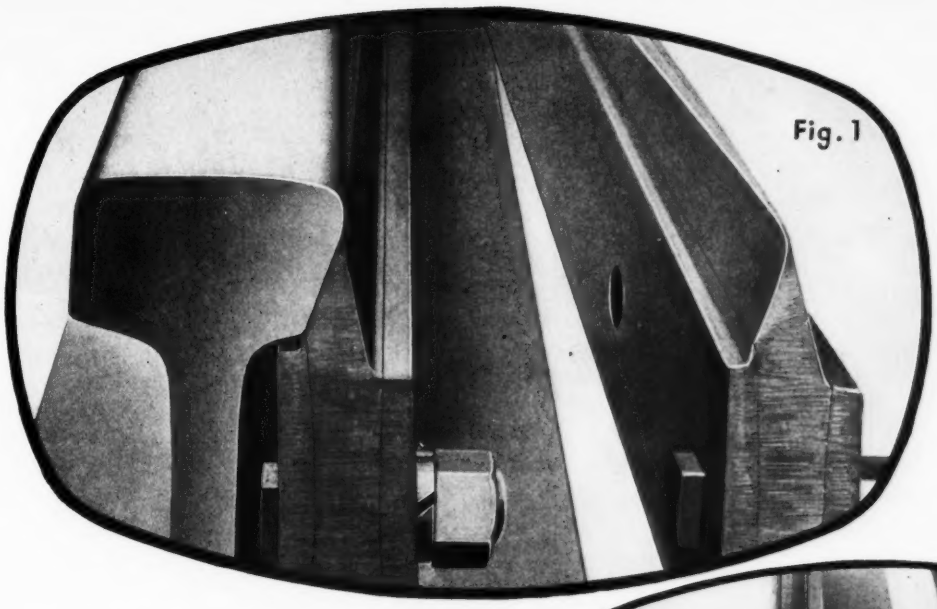
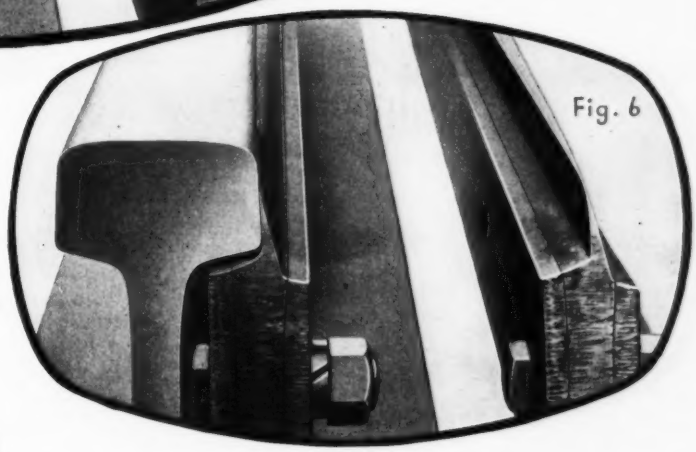


Fig. 1.—Pnotograph end view of Samson Switch Point

COMPARED WITH

Fig. 6.—Photograph end view of common Standard Switch Point



The Switch Points are planed in accordance with A.R.E.A. detail No. 1000, except to fit undercut stock rail; other details are made to conform to A.R.E.A. plan No. 101 or to standards of railroad ordering.

On account of web clearances the inside reinforcing for some sections of rail is not to be carried to the end of the switch points or it may be omitted.

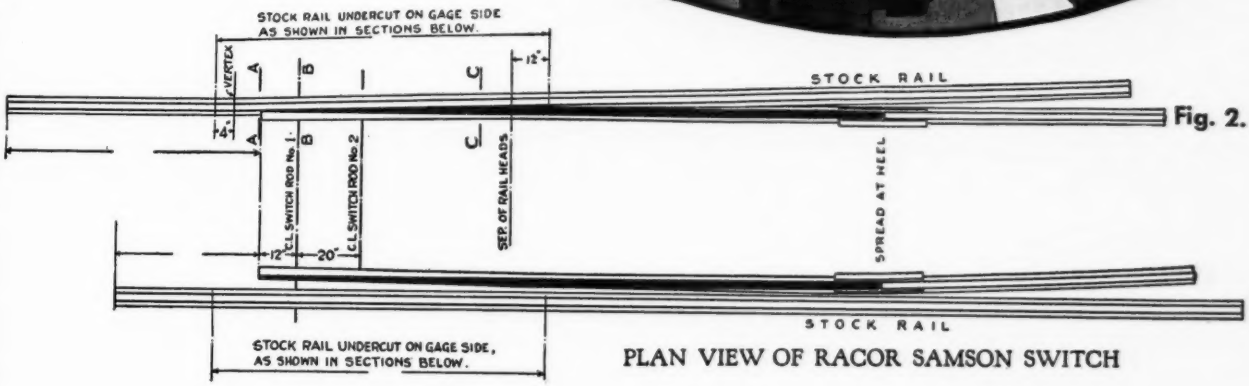


Fig. 2.

PLAN VIEW OF RACOR SAMSON SWITCH

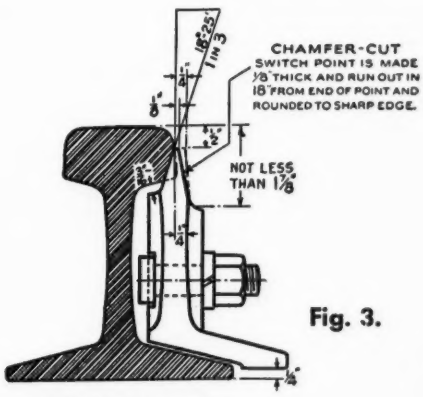

CHAMFER-CUT
SWITCH POINT IS MADE 1/8" THICK AND RUN OUT IN 18" FROM END OF POINT AND ROUNDED TO SHARP EDGE.
1 IN 3
NOT LESS THAN 1 1/8"

Fig. 3.

SECTION A-A

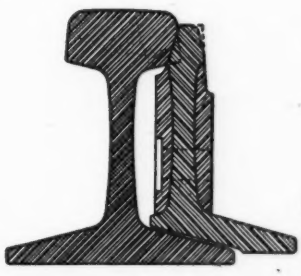


Fig. 4.

SECTION B-B

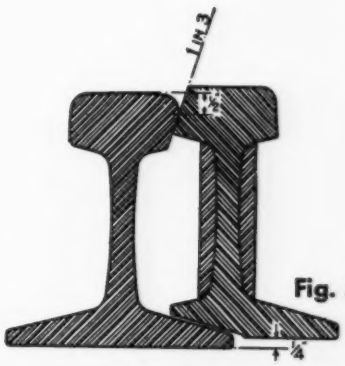


Fig. 5.

SECTION C-C

·REAL NEWS·

THE RACOR SAMSON SWITCH

THE RACOR SAMSON SWITCH—An innovation that realizes a remarkable economy and also assures added safety. *For details see preceding pages.*

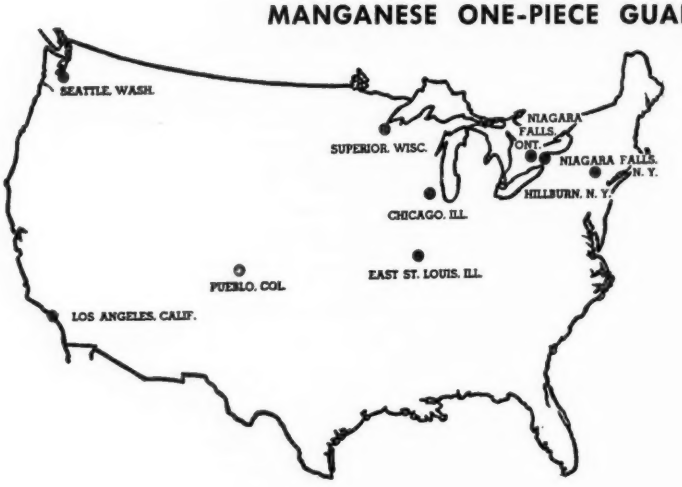
RACOR TRACKWORK SPECIALTIES—Racor Specialties are the result of over fifty years experience in the design and manufacture of track appliances. These appliances include:

GUARD RAILS AND FIXTURES	**SWITCH STANDS**
LIGHT RAILS AND MISCELLANEOUS EQUIPMENT	**SWITCHES**
SPECIAL TRACKWORK FORGINGS	**FROGS**
UNIVERSAL PERMANENT HIGHWAY CROSSINGS	**CROSSINGS**

A large part of our output is designed by our engineers to fit particular conditions and requirements. We always welcome inquiries for special information or plans pertinent to individual needs.

MANGANESE STEEL materials compose a large percentage of our output. Notable among these are:

RACOR MANGANESE FLANGE FROGS
RAIL BOUND MANGANESE FROGS
AMSCO MANGANESE CROSSINGS
MANGANESE ONE-PIECE GUARD RAILS



For further information write your nearest Ramapo office

RAMAPO AJAX CORPORATION

Racor Pacific Frog and Switch Company . . . . . Los Angeles—Seattle
Canadian Ramapo Iron Works, Limited . . . . . Niagara Falls, Ontario

General Offices—230 Park Avenue, New York

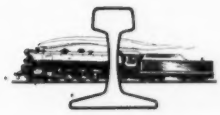
Sales Offices at Works and McCormick Bldg., Chicago Midland Bank Bldg., Cleveland, Ohio Builders Exchange Bldg., St. Paul Metropolitan Bank Building, Washington Union National Bank Building, Houston, Texas

Nine Racor Works: Hillburn, N. Y. Niagara Falls, N. Y. Chicago, Ill. East St. Louis, Ill. Superior, Wis. Los Angeles, Cal. Niagara Falls, Ont. Pueblo, Col. Seattle, Wash.

RACOR TRADE MARK REGISTERED

SPECIALISTS IN TRACKWORK MATERIALS

Railway Engineering and Maintenance



1931-1932

A Review of the Old—A Forecast of the New

THE year 1931 will go down in history as the period of most acute depression in this generation. This will be true because no preceding year has witnessed such drastic and such prolonged reductions in traffic, in earnings and in expenditures. It will be true also because there are numerous indications that the bottom has been reached and that we are now on the upgrade.

The effects of the depression have been especially pronounced in engineering—construction and maintenance—activities, for they are capable of postponement to a greater degree than those of most other departments. As a result, when the dawn breaks, as it is now apparently doing, the outlook is all the more optimistic by reason of the accumulation of deferred work which awaits attention in addition to that which is arising currently. The year 1931 was one of adversity; 1932 bids fair to be one of recovery.

The Year's Summary

The year's record may be summarized briefly as follows:

Freight traffic fell 19 per cent below that of 1930 and approximated that of 1921.

Passenger traffic decreased 19 per cent from that of the previous year, being less than for any year since 1904.

Total operating revenues declined 20 per cent from 1930, being lower than in any year since 1917.

Net railway operating income aggregated $534,000,000, a decline of $351,000,000 or 40 per cent under 1930. The decline from 1929 was $741,000,000 or 58 per cent.

The rate of return earned on property investment was 1.99 per cent as contrasted with 3.46 and 4.84 per cent, respectively, in 1930 and 1929.

Maintenance Curtailed

With such marked declines in traffic and in earnings, it was to be expected that expenditures in all departments and especially in maintenance of way, would be cut to the bone in 1931, and this was what occurred—bringing the total expended by this department to the lowest figure since 1917, or the lowest since material and labor costs rose to their present levels. The extent of the reduction is shown by the fact that for the first 10 months of the year the Class I railways of the United States spent $470,724,273 for maintenance of way, as compared with $620,090,685 and $737,344,717 in the corresponding periods of 1930 and 1929, respectively. Based on these figures, it is estimated that the expenditures for the year approximated $553,000,000 or $160,000,000 (22 per cent) less than in 1930, and $312,000,000 (36 per cent) less than in 1929.

The annual expenditures for maintenance of way and structures of the Class I railroads of the United States for recent years were as follows:

1917		$ 445,735,253
1918		656,600,508
1919		778,340,219
1920		1,051,279,530
1921		764,662,651
1922		735,700,633
1923		821,376,694
1924		802,322,886
1925		824,892,860
1926		874,244,048
1927		878,289,313
1928		845,612,453
1929		862,701,113
1930		713,012,582
1931	(last 2 months estimated)	553,000,000

Even more significant than the above figures is the fact that the largest monthly expenditure in 1931—for May—was less than the smallest outlay in any month between February, 1923, (a short month) and November, 1930, and that the average monthly expenditure in 1931 was less than for any individual month between March, 1918, and December, 1930. Even with this marked retrenchment, however, one should not lose sight of the fact that the maintenance of way expenditures during 1931 approximated $2,000,000 per day and that the average daily purchases of materials for roadway and structures approximated half that amount.

Properties in Good Condition

Contrary to what might be expected from such drastic curtailment in expenditures, the tracks and roadway enter 1932 in relatively good condition. By this it is not intended to minimize the extent of the toll that has been exacted from the properties through under-maintenance, for a road cannot long forego the renewal of rail or ballast, or postpone the painting of structures without facing a day of reckoning. Rather, it is to be pointed out that the properties are in surprisingly good condition in the face of the marked reductions in upkeep.

In the years preceding 1930, the properties had been brought to the highest standards in history through liberal expenditures for heavy rail, treated ties, better ballast, stronger fastenings and all other materials that enter into modern track, as well as for paint and those other accessories that denote well-maintained structures. The roads were equally well fortified with equipment of modern design to bring the costs of performng work to the minimum.

For this reason, as traffic and earnings fell off abruptly throughout 1930 and 1931, it was possible to curtail expenditures for maintenance in like degree without seri-

ously endangering operation. Maintenance expenditures in 1930 were reduced $128,000,000 or 15 per cent below the average for the preceding five years, but the reserve strength that had been implanted in the properties was such that the effect of the retrenchment was not noticeably serious. As a result, the roads entered 1931 with their physical properties as a whole in reasonably good condition.

From the standpoint of roadway maintenance, 1931 was a year of limited requirements. It is generally recognized that the wear and tear on a property is influenced in part by the amount of traffic handled. To this extent, the amount of deterioration resulting from use last year was less than normal. Also, like the years immediately preceding, 1931 was reasonably free from floods and other agencies destructive to roadway. In fact, the year was abnormally favorable from this standpoint, taking the country as a whole. Water is commonly recognized as the greatest enemy of track and, like 1930, the past year was one of sub-normal precipitation over the larger part of the continent. This contributed in no small measure to the stability of the roadbed during this period and likewise tended to offset deficiencies in maintenance.

Another influence was the further fact that, by reason of a negligible labor turnover, the increased efficiency that always characterizes periods of labor surplus, and the added output that accrued from the large outlays for labor-saving equipment during the years immediately preceding, the amount of productive work done was considerably in excess of that indicated by a direct comparison of expenditures.

The present condition of the properties is due even more, however, to the liberal programs of improvement prior to 1930, in which vast service units were plowed back into the properties in the form of stronger construction and all that large variety of materials and equipment that tend toward lower maintenance costs. The present condition of the roadway properties in the face of the drastic cuts in expenditures of the last two years affords striking evidence of the economy of making liberal expenditures of this character that should not be lost sight of when conditions again return to normal and funds are available for more active maintenance work.

Improvements Curtailed

In keeping with the curtailment in expenditures elsewhere, the outlay for improvements chargeable to capital account was cut sharply during 1931, thereby interrupting the extensive program inaugurated in 1922 for the modernization and improvement of the railway properties, on which the roads have spent approximately $850,000,000 annually during each of the last eight years, the total outlay in this period having amounted to more than $6,750,000,000. Even in 1930 the roads continued this program in response to the plea of President Hoover, and in that year they spent $872,608,000 for improvements chargeable to capital account. In the closing months of that year, however, when they saw the recession in business was of more than passing duration, they began to curtail these expenditures severely and this policy prevailed during 1931, with the result that the total outlay approximated only half of that for the preceding year.

Even this total, however, does not show the full effect of the curtailment, for it includes heavy expenditures made during the earlier months of the year on projects which have since been brought to completion. As a result, construction work is now on a lower level than at any time since 1921. Even in the face of this fact, however, roadway improvements share more liberally than those for equipment, 75 per cent of the total expenditure going for this class of improvements in the first six months of 1931 as compared with 25 per cent for equipment. The capital expenditures made from the inauguration of the extensive program in 1923 to date, together with the division between roadway and equipment follows:

Year	Total Capital Expenditures	Expenditures for Equipment	Per Cent of Total	Expenditures for Roadway	Per Cent of Total
1923	$1,059,149,426	$681,723,991	64	$377,425,435	36
1924	874,743,228	493,608,460	56	381,134,768	44
1925	784,191,000	338,114,000	45	410,077,000	55
1926	875,000,000	380,000,000	43	495,000,000	57
1927	771,552,000	288,700,000	37	482,852,000	63
1928	676,665,000	224,301,000	33	452,364,000	67
1929	853,721,000	321,306,000	38	532,415,000	62
1930	872,608,000	328,269,000	38	544,339,000	62
1931*	400,000,000	100,000,000	25	300,000,000	75

*Estimated on basis of figures for first six months.

Large Mileage of New Lines Completed

In spite of the marked reduction in expenditures for construction projects, a larger mileage of new lines was completed in 1931 than in 1930—748 miles as compared with 513 in 1930, and a figure exceeded only three times since 1917. This was due to the large amount of new construction undertaken in 1930 and carried over into 1931 for completion. In Canada, 250 miles of new lines were completed, as compared with 385 miles in 1930. In Mexico, construction was practically at a standstill, only 4 miles being finished last year. In both Canada and the United States, highway grade separation projects continued to demand an increasingly large proportion of the funds available for construction.

Closely allied with new construction, a total of 795 miles of line were abandoned in the United States last year, or 101 miles more than in 1930. This is 47 miles in excess of the mileage of new lines completed.

In signaling, the railways installed approximately 61 per cent as many units as in 1930. Relatively little activity was evidenced in train control, only one installation of 133 miles being made. Likewise, the mileage of automatic signals installed was only 40 per cent of that for 1930. Centralized train control, however, received increased attention by reason of its demonstrated ability to increase the traffic capacity of a line and thereby postpone the construction of additional tracks. This equipment was installed on 418 miles of lines in 1931. Highway crossing protection also received much attention, signals or gates or both being provided at 1,136 crossings during the year.

In equipment, orders dropped to a low level, only 14,828 freight cars being ordered from United States and Canadian builders in 1931 as compared with 49,496 in 1930 and 124,140 in 1929. Likewise, only 43 passenger cars were ordered in 1931 as compared with 885 in 1930 and 2,458 in 1929. In locomotives a somewhat better showing was made, with total orders reaching 265 units, as contrasted with 555 in 1930 and 1,395 in 1929. Of 235 locomotives ordered for use in the United States, 152 were electric locomotives, for use principally on the newly-electrified lines in the vicinity of Philadelphia.

As was to be expected in a period of widespread unemployment, 1931 was characterized by an almost complete absence of labor troubles. The surplus of labor was of little value to the roads, for, rather than being in the market for labor, they were almost universally confronted with the necessity of laying off men already in their employ. The reduction in pay rolls was effected

in part by dividing the amount of work available among the men through part-time employment and in part by absolute reductions in forces. The possibilities of the first method of retrenchment are shown by the record of one road which has long given close attention to the stabilization of its forces and which has been able to avoid laying off any of its maintenance employees during the present depression by reducing its working period to five days and more recently to four days. While less established as a standard practice elsewhere, many roads have worked five-day weeks from time to time to keep their expenditures for labor within the amounts available.

In spite of these measures, however, drastic curtailments in forces have been made. The extent of these curtailments is shown by the fact that in the first nine months of 1931, the latest for which these figures are available, the total number of men employed in the maintenance of way and structures ranged from 269,900 in February, to 310,044 in June, compared with a minimum for 1930 of 274,479 in December and a maximum of 408,042 in May. An even more striking comparison is shown by the fact that the maximum force in any month in 1931—310,044—was smaller than that employed in *any* month between January, 1922, and November, 1930. In other words, maintenance of way operations have been substantially on a winter basis since October, 1930.

Little Change in Wages

Aside from clerical and supervisory forces, the year was noteworthy for the stabilization of wages among maintenance of way employees. With one exception there was little attempt to disturb existing wage scales until late in the year when railway managements entered into conference with representatives of 21 labor organizations, including that representing maintenance of way employees, looking to a reduction in wage rates. Out of these conferences has come an agreement that both employers and employees will appoint representatives with authority to negotiate a 10-per cent reduction in wages for one year—a reduction which bids fair to materialize early in the year. This development is of major importance as it is an evidence of the recognition of the mutuality of interest between employer and employee that has much to commend it as a substitute for the controversies of the past.

Much Development in Work Equipment

While the expenditures for work equipment were materially less in 1931 than in the years immediately preceding, this period was not without benefit to the builders of such equipment, for, so far as operations permitted, this equipment was utilized more intensively than ever before by reason of the economy attending its use. The recognition of the intrinsic merit of work equipment is more firmly established at the present time, therefore, than ever before.

Knowing of this fact, builders of work equipment have not only made preparations to push its sale actively as railway earnings return to normal, but they have been especially busy in developing new units and redesigning old ones to increase their versatility. As a result, more new equipment is now awaiting introduction than at any previous time, and the utilization of machinery to reduce the drudgery of maintenance work may be expected to proceed more rapidly in the immediate future than heretofore.

One of the developments which assumed definite form during the last year and which is certain to exert an increasingly profound influence on maintenance of way activities of the future is the movement toward the reorganization of maintenance of way forces, especially of the track forces. This trend is an outgrowth especially of a stronger track structure and of the correspondingly lessened amount of work necessary for its maintenance. It is also the logical result of the growing use of power equipment, which, in turn, has created the problem of (a) equipping each gang with those units adapted to its work, with the correspondingly large investment, or (b) concentrating such equipment in a smaller number of gangs which specialize on specific tasks and thereby use the equipment more continuously.

From the various approaches to this problem have come several plans. On the Milwaukee, for illustration, further progress was made during the year in transferring much of the routine track maintenance work that is susceptible of mechanization from section gangs to special forces equipped with tie tampers, power jacks and other mechanical aids which they can use continuously, thereby reducing the work of the section gangs largely to that of track patrol. On the Burlington, a widely different plan is in the making whereby, as described on page 39, the number of section gangs is reduced in order that the number of men in each gang may be increased to enable them to work more efficiently.

What of 1932?

The record of 1931 has been a distressing one. There have been few bright spots. In by far the largest measure, it has been a year of troubles rather than successes. A year ago the opinion was widely held that while the first half of 1931, from a traffic standpoint, would be worse than the closing months of 1930, the latter half would be better, and not a few ventured the belief that it would be sufficiently better to overcome the loss in the first half of the year and bring the record for the entire 12 months up to that for 1930. That this conclusion was in error is now common knowledge.

In the closing weeks of 1931 there were, however, certain developments that justified the conclusion that the worst has now been passed and that business is on the upgrade. One of these indications was the fact that traffic is now declining less markedly relative to that of a year ago than heretofore. Still another development in the closing weeks of the year was the granting to the roads by the Interstate Commerce Commission of an increase in freight rates that is estimated to add more than $100,000,000 a year to their net revenues, effective in the early part of January. Another and even more promising development is the prospect that the roads will reach an early agreement with their employees for a temporary reduction in wages, which will add approximately $215,000,000 yearly to the net revenues of the roads. With increased net revenues totaling more than $300,000,000, the credit of the roads will be revived and they will be enabled to undertake much needed maintenance work. This, in turn, will not only provide employment for many of the men whom they have been forced to furlough, but will also enable the roads to enter the market for necessary materials and equipment.

With upkeep expenditures curtailed for two years and with a rapidly mounting accumulation of deferred maintenance at a time when competition demands higher standards of service than ever before, it can readily be seen that the only requisite is the earnings necessary to finance this program. These earnings appear now to be in sight, in part at least. Supplemented as they will be by the revival of business in general, it is a fair assumption that improvement is near at hand.

A Sand Fence From the Track Side

How One Road Controls Drifting Sand

Leveling and oiling the right of way and adjacent territory, sprinkling the track and constructing drift fences overcome such trouble in desert country

ONE of the problems which confronts the railroads rather infrequently, but which is particularly difficult of solution in the southwest, is that of controlling sand drifting over the right-of-way, and, thereby, maintaining safe and clean track. In many respects, the problem of drifting sand in the desert sections of the southwest is comparable with the snow problem of the north, and yet, for a number of reasons, the sand, and the maintenance of safe-operating and clean track where it drifts, present a problem of even greater concern than snow.

To at least some extent, all of the railroads operating in the southwest are troubled with sand blows and sanded track, which is invariably the result, and have adopted measures to relieve this condition. On one southwestern road, over parts of which prolonged sand storms occur at times, a number of interesting methods of controlling the drifting of the sand and of holding down such sand as is constantly on the roadbed, have been adopted, including the placing of from one to three lines of sand fences along or beyond the right-of-way line and the oiling and sprinkling of the roadbed with water. In addition, this road has used with success the unusual expedient of leveling off and oiling the right-of-way and the property from 100 to 800 ft. each side of the track, forming a smooth hard surface over which the sand is carried easily by the wind and thereby kept from accumulating and eventually forming into drifts.

Sand Problem Was Serious

In many sections of the southwest the problem of drifting sand has been increasingly annoying in recent years with the greater speed of trains and the higher class of passenger service afforded. In these sections, which are usually arid, except for such irrigation as may be provided, the sand is unusually fine in character and is whipped about with great force by the wind. Storms, which at times last for several days, darken the desert with the sand carried in the air and, in the midst of severe blows, visibility is limited to 30 or 40 ft.

The most serious result of these storms, and to a lesser extent of the more local blows which have little effect on the atmosphere, is the drifting of the fine sand on to the tracks, where two or three inches over the rails is often hazardous to train operation. This is true particularly because of the rapidity with which the sand accumulates or drifts on the track, if uncontrolled, especially in rough or undulating territory. In level territory, the sand piles up on the storm side of the rails, while the slightest breaks in the surface of the ground or sparse vegetation form the nuclei of sand drifts. In severe storms these drifts develop quite rapidly and would build themselves back over the right-of-way, completely covering the tracks, if they were not removed. At certain places drifts are known to build up at the rate of from 3 to 12 in. in 5 hours' time.

The sand is so fine that it penetrates the interiors of passenger cars at times, which not only makes for the discomfort of passengers, but requires additional work on the part of the train attendants to keep the cars clean and tidy. From the standpoint of the equipment itself, including locomotives, the most objectionable feature is the fact that the sand gets into the journal bearings and working parts and thereby increases maintenance costs.

The territory which has given the most serious trouble

on the road in question includes two stretches, one of 10 miles and the other of about 36 miles. In the latter territory severe trouble has been experienced over only about 10 miles where the land is rolling and where the sand is of a particularly light drifting character. In the remaining 26 miles, the sand is susceptible to drifting, but the country is so flat that little trouble is experienced in this regard.

A further agency controlling drifting in this territory is the fact that the country is quite generally covered with desert grass and greasewood brush, which not only has a tendency to retard the velocity of the wind near the ground, but also to cause uniformity in the settling of such sand as is moved about. In the many other miles of desert country traversed by this road, a certain portion of the track becomes sand dusty, but no difficulty is experienced with drifting sand since the desert sand generally is coarser than the "blow" sand and has a tendency to compact solidly over the surface.

In the territory subject to drifting sand, special precautions have been taken to safe-guard train operation, and many expedients have been adopted to retard the movement of the sand on to the track and to make inoffensive such sand as accumulates there. During severe sand storms, section forces used to be constantly on the line, night and day, to keep the track clear and the train dispatchers informed as to conditions. The dispatchers, in turn, advised the train crews as to conditions and issued such slow orders as were necessary. Also, at a number of points, permanent slow orders of 20 and 30 miles an hour were in effect, not so much because of any dangerous conditions existing, as by reason of the extremely dusty condition which prevailed, causing discomfort to passengers on the observation platforms of trains, and also within trains operated at high speeds.

Shovels were the most practical means of removing the sand from the tracks during storms, and they are still used in this work to a large extent. This is true not only because of the adaptability of the shovel to the work, but because the sand, if thrown into the air, is blown far from the track.

After a severe storm, or after a succession of lesser storms, a Jordan spreader or a ballast plow was usually run over the worst territory to throw back any sand drifts which had accumulated. Teams and scrapers were also used at times to haul the drifting sand back from the track, and at other times, a crane equipped with a dragline bucket was used to level off the drifts. Frequently it was necessary to load the sand on cars and to haul it away for disposal elsewhere on the line, usually on the sides of the fills not subject to high winds.

In coping with the problem of drifting sand and dusty track on this road in recent years, a number of interesting expedients have been adopted, which have proved very effective. Possibly the most interesting and unusual expedient employed in this regard is that of smoothing off and oiling the property adjacent to the tracks, not only to hold down the sand in this area, but to form a smooth pavement-like surface over which the sand, blown by the wind, will be carried without settling or piling up. This method of preventing drifting has been used so effectively in the 36 miles of "blow sand" territory on the desert that at the present time only about 10 miles of this stretch cause any concern. Likewise, in the 10-mile stretch mentioned, where drifting conditions used to be particularly severe, there are only about two miles where this condition has not been remedied completely by the measures taken.

In this oiling work, which at many points extends as far as 800 ft. each side of the track, fuel oil, just as purchased by the road for use in its oil-burning locomotives, is sprayed over the sand, but only after the sand has been carefully leveled off to a perfectly smooth surface by scrapers and shovels. In this preparatory work, even the smallest hump or bit of vegetation is removed to clear away what might become a nucleus of a sand drift.

The first experiment of this nature was carried out during the summer of 1923, when eight cars of oil were sprayed on sand adjacent to the track. Oil had been tried in earlier attempts but practically the full benefit was lost since no attempt was made to level off the ground prior to the oiling. Oiling sand dunes and ridges prevented the shifting of the sand in the dunes and ridges themselves, but did not stop blow sand from drifting over and around them, and accumulating rapidly over the oiled surfaces.

On the desert, where the new leveling and oiling was carried out a sufficient distance each side of the track, the drifting problem has been practically solved and, except for a few points, the only additional work or attention which is required is patch-spraying each year and a light general spraying about every three years. In the worst blow sections on the desert, oiling is required about once a year to hold down the gradual accumulation of new sand over the oiled areas. This subsequent oiling, which is usually done during April and May, is much lighter than the initial oiling and is accomplished much quicker.

Spray Right-Of-Way With Special Equipment

Oiling of the right-of-way and adjoining property is done with a special oil pump car which is taken over the line in a work train which carries also from one to three oil tank cars. The pump car is merely a box car equipped with a steam pump and an oil pressure tank, and providing space for the hose and tools used in the spraying work. The hose used is of rubber, wrapped with coiled steel wire to prevent kinking. It is 1½ in. in diameter and is separated into 50-ft. lengths for convenience in handling. Connections for the hose are made on each side of the pressure tank so that both sides of the right-of-way can be sprayed at the same time. The nozzles are merely sections of 1½-in. brass pipe, with flattened orifices, designed to throw a spray.

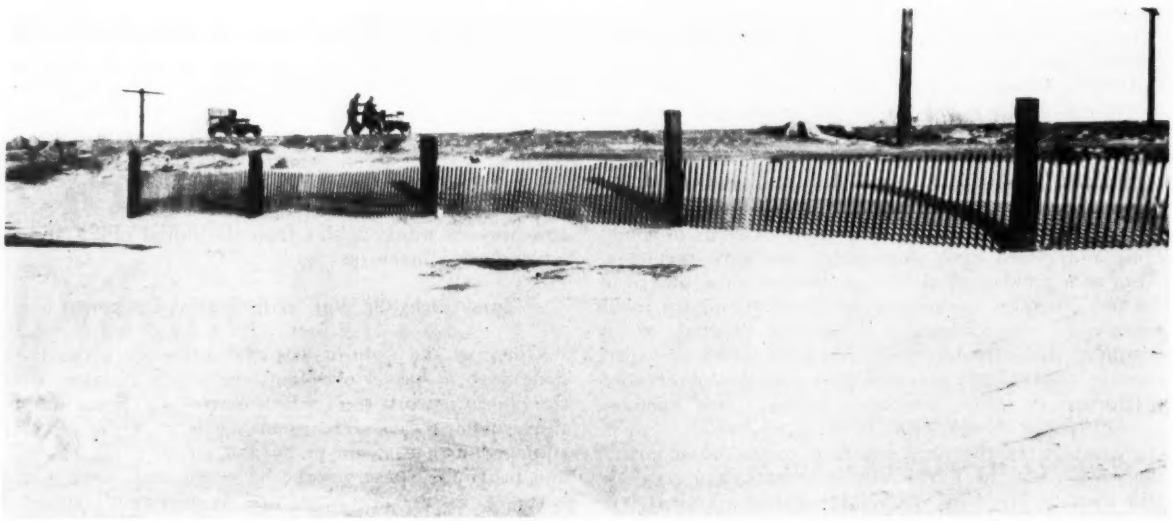
The oil is applied just as received in tank cars from the California oil fields, except that it is heated to near the boiling point by steam supplied to heating coils in the tank cars. Usually, the heating of the oil, which is to make it flow readily, is done during the night prior to its use, at an adjacent engine terminal, where connection is made with the steam lines from the terminal power plant. In particularly cold weather, additional heat is supplied on the line from the locomotive.

The steam pump in the oil car, which is operated by the locomotive steam supply, develops sufficient pressure to throw two oil sprays 50 ft. from the car, so that when it is desired to oil only this distance from the track, only short-length hose sections are used and the spraying is done directly from the car. By adding hose lengths, both sides of the track can be oiled out to about 300 ft. from the track, while when oiling beyond this distance, up to about 800 ft., only one side is oiled at a time because of the loss of pressure in the long hose line.

Depending upon the distance to which the oiling is carried and the continuity of the work, from one to three cars of oil, of about 12,500 gal. each, can be applied in a day. This depends also to a large extent upon traffic interference, especially in single track territory where it is necessary to clear for trains. In the

initial application, the surface of the sand, after being carefully smoothed off with scrapers and shovels, even to the extent of removing deep footprints, is saturated thoroughly with the oil to form an unbroken oiled blanket about ⅛-in. in thickness. This forms a surface which cannot be picked up by the wind and on which the "blow" sand will not accumulate very rapidly, while such sand as does accumulate usually does so in patches and is smoothed off and oiled the following spring. The same equipment used in the general oiling work is also used to oil the sides of high embankments and of deep cuts where they are affected by either the wind or rain.

The force required in the right-of-way oiling work in recent years has varied from about 5 to 13 men depending upon the width oiled and the amount of smoothing up necessary. Where oiling is done for only 50 ft. each side of the track, two men can handle the hose, but when the work extends as far as 600 to 800 ft. from the track, from 10 to 12 men are required on one hose line to move it along as the work progresses.



A Sand Fence Retards the Movement of the Sand Short of the Track

Sand Fences Prove Effective

Supplementing the oiling of the right-of-way and beyond in an effort to control the drifting of sand near the track, this road has had considerable success with the use of sand fences to break the force of the wind and to cause the sand to drift at a distance from the track, exactly as with the snow fence used in the north. These fences were first used on this road in 1925, when a double-row installation about two miles in length was made in a particularly troublesome stretch on the desert. In this installation, the common wire and vertical slat fencing was used, 4½ ft. high, with posts of old crossties at intervals of 16 ft. Both lines of fencing were installed on the windward side of the track, one about 150 ft. away and the other about 150 ft. farther out.

Since this first installation, which proved very effective, particularly in conjunction with the oiling of the right-of-way out to the first fence line, a number of additional miles of sand fences have been installed, which include about 5½ miles of triple fence put up in 1929. In the work done in that year, two lines of fencing were installed about 150 ft. apart on the windward side of the track, with the nearest fence about 150 ft. from the track, and a third line of fencing was set up on the opposite side of the track, about 150 ft. from it.

The fences have proved very effective in localizing all drifting along the fences themselves and have thus removed from the air a large amount of the sand which would normally be blown across the track with its tendency to drift at the rails and at irregular spots in the surface of the ground, even where oiling has been done. When a drift has built up to the height of the fence, or covering it, the fence is pulled out and either moved a few feet farther back from the track or reinstalled on top of the drift. From present indications, it appears that, following this practice, it will be a considerable number of years before any of the drifts caused by the fencing will work their way in as far as the right-of-way.

In addition to oiling the right-of-way and the adjoining property on both sides of the roadbed, and the installing of fences in the blow-sand territory the track is oiled to hold the dust which would otherwise be stirred up by the operation of trains at high speeds. In fact, about 200 miles of track is oiled in territory where there is some settlement of sand on the track. For about 100 miles in the oiled territory, where, on account of the sand, it has been found advisable to use ballast of decomposed granite and sand, the entire roadbed is oiled each side of and between the rails. The remainder of the track in the territory oiled, as is the case generally over the whole road, is ballasted with crushed rock and pit-run gravel, and in this territory the oil is applied only to the shoulders of the roadbed, beyond the ballast toe line.

The roadbed oiling is done entirely independent of the right-of-way oiling and with different equipment, but at about the same time, in April and May, after tie renewals have been completed for the year and in advance of the heavy spring passenger business. The equipment used in the track oiling consists merely of pipe attachments connected directly to the bottom outlets of the roadhaul oil tank cars. The pipe used is 2½ in. in diameter, and the spray sections are provided with ¼-in. holes drilled in the bottom side from 2 to 2½ in. apart. The different pieces include essentially an 8-ft. length, which extends under the car, transverse to the track, and extensions for each end for oiling the shoulder of the roadway.

The 8-ft. length, which is provided with a valve at each end, is connected at the center to the outlet pipe of the car and is perforated, except directly over the rails,

wherever it is desired to oil the roadbed proper. At the ends of this cross piece are short drop lengths of pipe with 90-deg. elbows at their lower ends, to which the extensions can be connected for oiling the shoulder of the roadbed. These extensions vary from two feet to nine feet in length, so that the proper length can be used to give the desired width of oiling in any particular territory, and any piece in use can be swung forward or backward in a horizontal plane in order to clear signal boxes, right-of-way markers and other obstructions close to the track.

In oiling the roadbed, from three to eight tank cars of oil and a flat car of sand are taken out in a work train, after the oil has been heated as in spraying the right-of-way, and from one to three cars are distributed at a time, depending upon the width to which the oiling is carried. If the roadbed is oiled only for the length of the ties, one car is tapped at a time, while if the oiling is extended out for a distance of four feet beyond the ends of the ties, a second car is tapped, which is equipped with an undrilled cross pipe under the car, with a four-foot perforated extension at each end. Operating together, one car oils the center of the roadbed, while the other distributes oil on the shoulders. In oiling out as far as nine feet from the ends of the ties on both sides of the track in single track territory three cars are tapped at a time, one oiling the track proper, the second with a nine-foot perforated pipe extension oiling one side of the track, and the third car with a similar pipe extension oiling the other side of the track.

By this method the flow of the oil through the orifices is not only more uniform throughout the pipes, but the oil train can be operated at a higher speed and with fewer stops to change the piping. A sand car is always the last car in the oil train and is equipped to spread a thin layer of sand over the rail to absorb any oil which might be blown on the head of the rail during the oiling operations. Application of the sand is necessary only when the full width of the roadbed is being oiled.

The force accompanying the oil train varies with the character of the work to be done, but usually includes a rider for each of the oil cars to be tapped at one time, who controls the drain-off valves in the valve towers on top of the oil cars, one man for the operation of each of the wing pipes in clearing obstructions, and either two or three men on the sand car. The amount of oil applied to the roadbed in the oiling operations is controlled almost entirely by the speed at which the oil train is operated, which is ordinarily from 10 to 18 m.p.h., depending upon whether it is the initial out-of-face oiling of the year, patch oiling, or a light subsequent oiling later in the summer. In the initial oiling, where it extends over a width of only 14 ft., which is the case on the major part of the territory in question, a tank car of about 12,500 gal. of oil is usually spread over an average distance of 3¼ miles of single track. The cost of oiling under this condition, including work-train service, averages about $30 a mile.

Water Sprinklers Hold Down Dust

As a result of the controlling of the drifting sand and the oiling of the roadbed proper, the dusty track conditions on certain territories were practically remedied, but in addition to the measures already described, this road takes an additional step to increase the cleanliness and comfort of its high-speed passenger business. This is the spraying of all dusty sections of track with water directly from the tender tanks of its passenger trains. This measure, which is under the control of the mechanical and operating departments, is accomplished by means of a patented track sprinkler which is mounted directly behind the forward tender trucks.

The sprinkler itself consists principally of a 2½-in. perforated sprinkler pipe with a top forward wind baffle, a 4½-in. feed pipe connecting the sprinkler pipe to the tender tank, a two-position, air-operated water valve in the feed line, and suitable air control lines to the locomotive cab with two hand cut-out cocks. The sprinkler pipe, which is about 8 ft. long and installed on brackets transverse to the track and in a horizontal position about 4½ in. above the top of the rail, is provided with two lines of 11/16-in. holes, spaced 2 in. apart in each line and staggered with those in the opposite line. These holes are drilled in the lower forward quarter of the pipe so that the normal flow of the water from the sprinkler under train operation will be forward and downward instead of downward and backward, as would be the case if the holes were directly in the bottom of the pipe. The only special feature about the water feed line is that it is extended 15 in. to 19 in. up into the tender tank to insure that over use of the sprinkler will not drain the tender and exhaust the boiler water supply.

Use of Sprinkler

In desert country the sprinkler is used quite extensively, particularly during the day and evening on trains with observation cars. Its operation is controlled by the fireman, with the two cocks located on his side of the cab, one cock providing full opening of the water valve and the other half opening. Observing the rear of the train, he starts the sprinkler whenever he notices dust being raised. He also operates the sprinkler over dirt road crossings, when passing trains, when passing through stations and wherever track gangs have disturbed the ballast. In this latter regard he is assisted by sprinkler signs, which are carried by the section forces and put up wherever necessary.

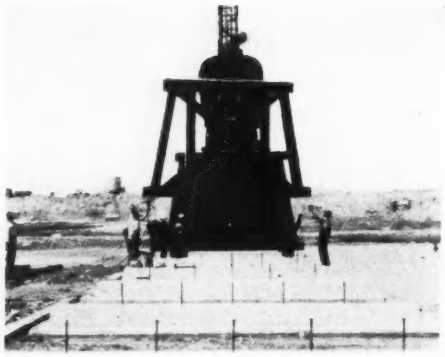
A Sand Storm

Half or full opening of the sprinkler valve is made entirely at the discretion of the fireman who is governed by the conditions observed, and, incidentally, by the water supply available in the tender. Since the installation of the sprinklers a few years ago, more frequent water stops have become necessary for certain trains in the desert country during dry seasons, since, at full opening, the sprinkler discharges from 150 to 300 gal. of water a mile on the track, depending upon the speed at which the train is operated. This is more than compensated for by the cooler and cleaner atmosphere about the trains, and the fact that speeds up to 50 m.p.h. are now permitted where slow orders of 20 m.p.h., because of dusty track, were formerly in effect.

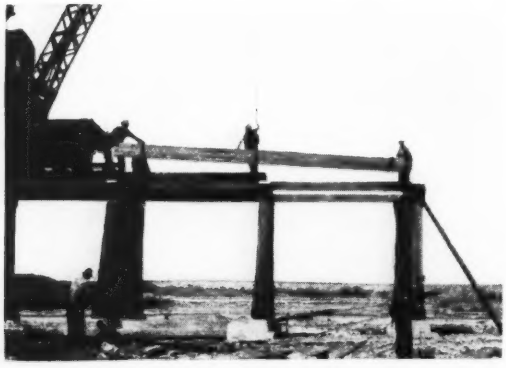
(Continued on page 50)

Bore Only Eight in Erecting

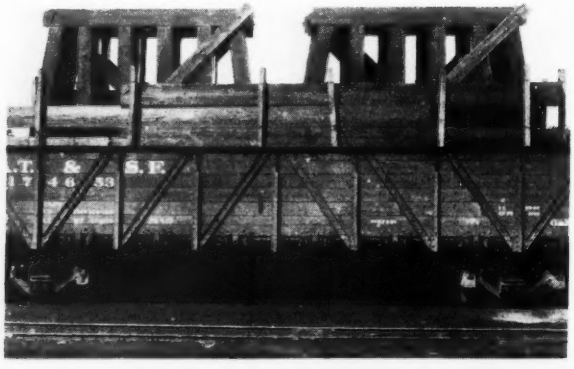
Frame bents for creosoted structure of Santa Fe were assembled at the treating plant where all timbers were preframed



Setting One of the Bents—Note Accurate Alignment of Bolts



Setting a Stringer—All Deck Material Was Delivered Along Side the Bridge

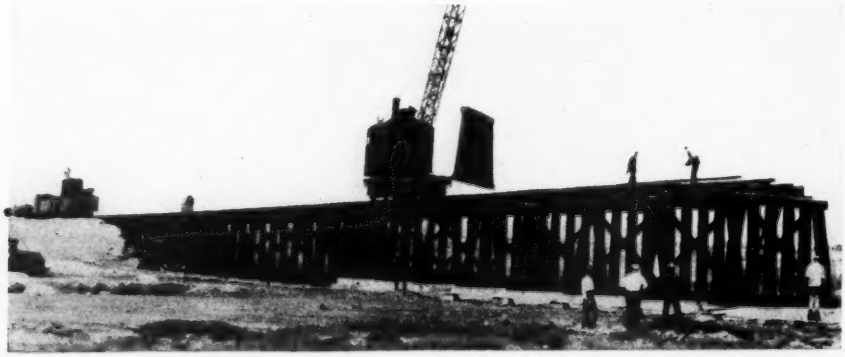


How the Bents and Timbers Were Delivered from the Treating Plant to the Bridge Site

LATE last fall the Atchison, Topeka & Santa Fe completed a creosoted timber trestle 980 ft. long, the construction of which involved the boring of only eight holes in the field. This trestle, which crosses the Pecos river on a five-mile spur extending from Loving, N. M., to a potash field now being developed by the U. S. Potash Co., contains 71 bents of which all but 7 creosoted pile bents at the ends are frame bents on concrete pedestals. Not only were all timbers framed and bored before treatment but all of the 64 frame bents were assembled at the treating plant and shipped to the bridge site in gondola cars, ready for erection on the pedestals as complete units.

A Frame-Bent Bridge

The structure has an open deck with 90-lb Santa Fe section rails on 6-in. by 8-in. by 9-ft. ties (sized to 5¾ in.), laid flat and spaced 14 in. on centers. It has inside guard rails and 4-in. by 8-in. guard timbers which are seated on the ties with Bulldog metal tie spacers in lieu of dapping the guard rails. Every fourth tie was bored on each end for a bolt through the guard timber and for a bolt through the outside stringer, in addition to standard boring of all ties for the track spikes. The stringers are 7-in. by 16-in., 28 ft. long, four to the chord, and were assembled so that the butt joints alternate over the bents. In addition to six vertical holes in the outside stringers for the bolts in every fourth tie, all stringers were bored for eight chord bolts on which cast iron separator rings were provided to space the stringers 1½ in. apart. The chords are secured to the bents by providing a long bolt for every third set of vertical holes through the outside stringers, which not



The Crane Carried the Bents Out on the Bridge to Set Them in Place

Holes 980-Ft. Trestle

only connects the stringers to the ties but also passes through the eye of an eye-bolt that passes in turn through the horizontal center line of the cap. A rather unusual feature of this structure is the use of longitudinal struts or horizontal braces. These are 6-in. by 10-in. by 14-ft. sticks placed on each side of the deck so as to form two continuous struts from end to end of the bridge. They are placed edgewise and are notched on the ends for a depth of six inches to fit down over the caps, while being drift-bolted to the caps through the projecting tongues.

The bents differ from usual construction only in that the posts are attached to the sills by steel straps or scabs made of ½-in. by 3-in. bars 1 ft. 8 in. long, which are drilled for two holes in the sills and two in the posts. The bents were made in four different heights, there being 3 with 7-ft. plumb posts, 37 with 9-ft. posts, 16 with 10-ft. posts and 8 with 12-ft. posts, all parts of which were laid out for cut-offs and holes so that the bents could be assembled after treatment without any cutting and also provide holes in the sills for five anchor bolts set in the concrete pedestals as well as the drift bolts for attaching the longitudinal struts to the caps.

Anchored to Concrete Pedestals

The floor of the Pecos valley at the bridge site is bed rock with a cover of sand, gravel and boulders that is too thin to afford holding power for pile bents. This explains the use of frame bents on concrete pedestals, which were constructed to a maximum depth of eight feet below the bent-seat level. At the ends of the bridge, where the bents are necessarily buried in the noses of the approach embankments, a total of seven bents, consisting of creosoted piles set in concrete bases, were provided. The concrete work was carefully done and the anchor bolts for the bents were set very accurately. However, to provide for unavoidable variations in the location of the bolts, sheet metal tubes three inches in diameter were placed around the bolts as they were set in the forms to allow the bolts to be bent slightly if necessary to match the holes in the sills. The holes formed by these tubes were filled with grout just before each bent was set.

The bridge materials were delivered from the treating plant at Somerville, Tex., to the end of the track on the west side of the river, with the first car to be unloaded at the head end so that a locomotive crane could pick up the bents in the required order. As a car was unloaded it was set out on a gravel pit track near the bridge.

As individual bents weighed as much as 6,900 lb. and as the caps were secured to the posts only by drift bolts, it was necessary to pick up the bents by means of wire rope slings around the sills, and to permit of the release of these slings when the bents were erected on the pedestals, it was necessary to set the bents down on two-by-four blocks which were later released by means of crowbars. Dangerous swinging of the bents while they were being carried out on the structure from the boom of the crane was avoided by attaching a guy rope which was held by a man who walked in the stream bed alongside the bridge. The top of each cap was provided with a cover or watershed of galvanized iron, which was applied in the field before the bents were erected. After the bent was set in place it was plumbed by means of temporary two-by-four longitudinal sway braces which were nailed to the new bent and the one previously set until the crane could place the permanent longitudinal struts.

Distributing Deck Material

The stringers, horizontal bracing, ties, guard timbers and rails were delivered from the cars to the point of erection by a team of horses which dragged them across the river bed beside the bridge, a road having been cleared of loose rock to avoid bruising the sticks. By delivering the deck material to the crane in this way, it was necessary for the crane to move back and forth over the bridge only when handling the bents. One piece of rail 17 ft. long was carried along with the crane to permit of an approximate temporary squaring up of the rail ends that facilitated the advance of the crane as each panel was decked.

The work of erecting the bridge was carried on with remarkable ease, considering that it was the first time that both the plant and field forces had been confronted with a job of this kind. Loss of time in jacking the bents off the car floors to get the rope slings under the sills will be avoided in the future by setting the bents on blocks or sleepers that will provide the necessary clearance under the sills. Consideration is also being given to the idea of fastening the caps to the posts by means of steel scabs, like those used at the bottom of

The Completed Pecos River Trestle

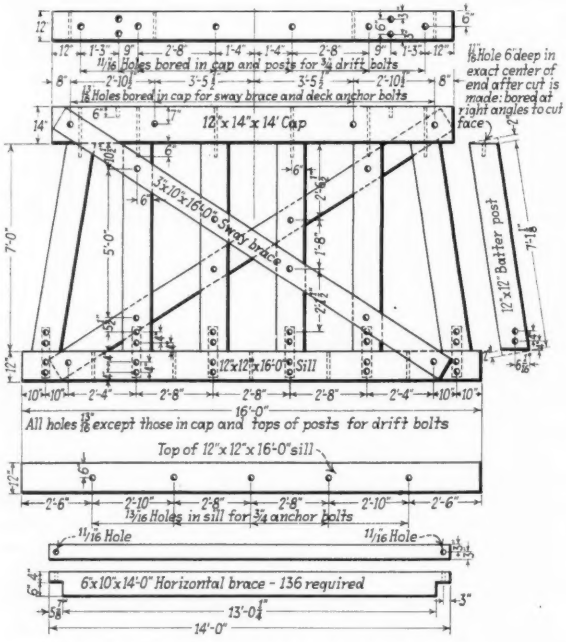
the bents, instead of drift bolts. This will help to overcome the slight lateral racking of the bents that was observed in one or two cases, although this is believed to have resulted almost entirely from failure to get the sway brace bolts tight enough.

The only cutting of timbers in the field was confined to a few of the longitudinal braces which had not been notched enough to allow for a slight oversize of some of the caps. It is expected to avoid this in the future by a change in the design of the decks which will permit of the elimination of these timbers.

Only Eight Holes Bored in the Field

In eight cases, it was necessary to redrill the stringers for chord bolts because the prebored holes did not match. The need for this will be obviated in the future by assembling the chords at the treating plant mill so that the holes can be drilled through the sticks while they are in exactly the same position that they will have in the bridge. All pieces will then be given erection marks.

That these difficulties were of little consequence is evident from the record of erecting progress. The erection of bents was started on September 3, when 3 were


11/16 Holes bored in cap and posts for 3/4 drift bolts
13/16 Holes bored in cap for sway brace and deck anchor bolts
11/16 Hole 6" deep in exact center of end after cut is made; bored at right angles to cut face
12"x14"x14' Cap
5"x10"x16'-0" Sway brace
12"x12"x16'-0" Sill
12"x12" Batter post
All holes 13/16 except those in cap and tops of posts for drift bolts
Top of 12"x12"x16'-0" sill
13/16 Holes in sill for 3/4 anchor bolts
11/16 Hole
11/16 Hole
6"x10"x14'-0" Horizontal brace - 136 required
16'-0"
14'-0"

The Working Drawings Were Completely Detailed

set in place. Eleven were erected on September 11, and 12 on the following day. All were in place on September 19, and the entire bridge was completed on September 28. The structure contained 197,579 ft. b. m. of timbers, which were given a full-cell treatment of creosote. Of this total, 82,973 ft. b. m. was in stringers, 30,312 ft. b. m. in ties and 84,284 ft. b. m. in the bents.

The plan for the preframing and assembling of material for the bridge was developed under the direction of G. W. Harris, chief engineer, A. T. & S. F. System with the co-operation of R. S. Belcher, manager of treating plants. The treatment and mill work was done under the direction of W. E. Jackson, superintendent treating plant, Somerville, Tex., and the erection was under the general supervision of W. H. Rochester, construction engineer. We are indebted for the above information to R. A. Van Ness, bridge engineer system, and to S. E. Ross, assistant engineer, construction.

Five Roads Report Results of Track Inspections

OF THOSE roads that make a practice of rating the various divisions, subdivisions and sections in the course of their annual track inspections, five have announced the results for 1931. These are the Delaware & Hudson, the Erie, the Lehigh Valley, the Norfolk & Western and the Pennsylvania. Brief abstracts of the reports of their annual inspections follow:

32 Prizes Awarded on D. & H.

As a result of the annual track inspection for 1931, 32 foremen on the Delaware & Hudson received prize awards totaling $1800—first, second and third prizes of $50, $25 and $15, respectively, for the three best main-line sections on the system; first, second and third prizes of $100, $75 and $35, respectively, for the three best branch-line sections on the system; first, second and third prizes of $100, $60 and $35, respectively, for the three best-maintained sections on each of the four main divisions of the road; first, second and third prizes of $100, $75 and $35, respectively, for the three best first-class and the three best second-class yards on the system; and first and second prizes of $50 and $25, respectively, for the two sections on each of the four divisions which showed the greatest physical improvement.

The foremen winning the first prizes in the various classifications, together with their ratings, are given as follows: Best main-line section on the system, F. Parillo, Saratoga division, Ballston, N. Y., with a rating of 97.5; best branch-line section on the system, A. Corsall, Saratoga division, South Glen Falls, N. Y., with a rating of 95.18; best main-line section on the Champlain division, G. LeClair, Douglass, N. Y., with a rating of 96.27; best main-line section on the Saratoga division, F. Parillo, who also won the system prize; best main-line section on the Susquehanna division, C. Caracciola, Bainbridge, N. Y., with a rating of 96.55; and best main-line section on the Pennsylvania division, Frank Merlino, Laflin, Pa., with a rating of 94.01. The first prizes for the best first and second-class yards on the system were won, respectively, by O. A. Rogers, on the Pennsylvania division at Wilkes-Barre, Pa., with a rating of 97.17, and T. Pasquarell, on the Susquehanna division at Mohawk, N. Y., with a rating of 96.77. The first prizes on the different divisions for the greatest improvement in sections were awarded to T. DePaul, on the Champlain division, at Port Henry, N. Y.; J. Izzo, on the Saratoga division, at Mechanicsville, N. Y.; A. Altieri, on the Susquehanna division at Glenville N. Y.; and D. Carpenito, on the Pennsylvania division, at Plymouth, Pa.

Cash Prizes Awarded on Erie

The Erie followed its practice of an annual track inspection, using its special instrument car and a special inspection committee to rate each section and district on the road. Altogether, 44 cash prizes, totaling $3,950, were given to supervisors and foremen for having maintained the best subdivisions and sections during the year. First and second prizes of $200 and $100, respectively, were awarded to the supervisors on each of the three districts of the road whose subdivisions received the highest and second highest ratings. Prizes of $100 were also awarded to those supervisors who maintained the

best branch lines on the New York and Eastern districts.

In addition to these prizes to supervisors, three "Banner" prizes of $150 each were given to the foremen whose sections received the highest ratings on each district, and 15 first prizes of $100 each and 18 second prizes of $50 each were given to the foremen who received the first and second highest ratings on individual subdivisions. The supervisors who won prizes, together with the amounts of their prizes, are as follows:

Division	District	Amount
	New York District—Main Line	
New York	A. F. Doyle, Goshen, N. Y.	$200
New York	C. L. Connor, Paterson, N. J.	100
	New York District—Branch Line	
Greenwood Lake & Newark Branch	T. J. Leonard, North Newark, N. J.	100
	Eastern District—Main Line	
Susquehanna	J. E. Whalen, Elmira, N. Y.	200
Allegany	P. J. Keenan, Cuba, N. Y.	100
	Eastern District—Branch Lines	
Buffalo	W. L. Kelly, East Buffalo, N. Y.	100
	Western District—Main Line	
Marion	W. H. Leatherman, Decatur, Ind.	200
Kent	G. L. Benson, Mansfield, Ohio	100

All Tracks Rated on the Lehigh Valley

As a result of the inspection for 1931, the New York division of the Lehigh Valley, of which J. F. Donovan is division engineer, received the highest rating of the year, having been given a grade of 99.56 per cent. The Lehigh division, of which R. E. Patterson is division engineer, received the second highest rating of 99.32 per cent, while the third highest rating of 99.23 per cent was given to the Seneca division, of which A. B. Shimer is division engineer.

The results by subdivisions show that the subdivision of J. Sheehan, which includes all of the New York division, again received the highest rating, the rating this year being 99.56 per cent, and that the subdivision of J. F. Reilly, on the Lehigh division, received the second highest rating of 99.36 per cent. The subdivision receiving the third highest rating was that of E. F. Dinan, supervisor on the Lehigh division, whose territory received a rating of 99.28 per cent.

$2,190 in Prizes on Norfolk & Western

Twenty-one hundred and ninety dollars was distributed in prize awards to 85 section foremen on the Norfolk & Western as a result of the annual track inspection on that road for 1931. First, second, third and fourth prizes were awarded generally in each district, these amounting to $40, $30, $20, $10 respectively.

On the basis of 10 as perfect, the average system rating for the year was established at 9.17, as compared with an average of 9.16 in 1930 and 9.11 in 1929. On this same basis, the highest rating given to any section this year was 9.48. This was awarded to A. C. Davis, of section No. 3 at Trazewell, Va., who was among those receiving the highest rating of 9.46 last year. The second highest rating of 9.47 was won by J. F. Rose, of section No. 10, Iaeger, W. Va., who was also among those who received the highest rating last year. The division receiving the highest rating for 1931 was the Pocahontas division, which had a general average of 9.26, the same average which was given to the Scioto division in winning the highest rating last year. The second highest division rating for 1931 was 9.23, which was given to the Roanoke Terminal.

The Tug Fork branch on the Pocohantas division received the highest grade of any roadmasters' district, this being 9.31, and, for the second time within the last two years, the greatest improvement in the condition of the track on any roadmaster's district, was made by the branch lines of the Radford division, (excluding the North Carolina and Saltville branches), with a rating of 8.69, an improvement of 0.14 over that of 1930.

Results on the Pennsylvania

There was some curtailment in the time and prominence given to the annual track inspections on the different parts of the Pennsylvania in 1931, but the usual inspections were made and all tracks were rated according to their standards of maintenance. On the Central region, the main-line subdivision receiving the highest rating was Subdivision 12 of the Pittsburgh division, headquarters at Trafford, Pa., of which C. J. Henry is supervisor and H. B. Russell is assistant supervisor. The subdivision receiving the highest rating on the Panhandle division was Subdivision 4, headquarters at Newcomerstown, Ohio, of which J. C. Dayton is supervisor and C. E. Ballard is assistant supervisor; and the subdivision receiving the highest rating on the Eastern division was Subdivision 1, headquarters at Federal street, Pittsburgh, of which D. E. Callahan is supervisor.

For the branch-line subdivisions, the highest ratings were as follows: Pittsburgh division—Subdivision 35, Barnesboro, Pa., of which M. J. Miller is supervisor; Conemaugh division—Subdivision 2, Kittanning, Pa., of which L. C. Martoia is supervisor; Monongahela division—Subdivision 14, Youngwood, Pa., of which O. L. Fisher is supervisor; Panhandle division—Subdivision 6, Wheeling, W. Va., of which James Foley is supervisor; Cleveland division—Subdivision 5, Orrville, Ohio, of which M. J. Bray is supervisor; Erie and Ashtabula division—Subdivision 2, Sharon, Pa., of which C. P. Sipe is supervisor; Buffalo division—Subdivision 9, Olean, N. Y., of which D. A. Sipe is supervisor; and the Renovo division—Subdivision 15, DuBois, Pa., of which F. H. Bentley is supervisor.

On the Eastern region, the main line subdivision receiving the highest rating was No. 32 of the Philadelphia division, headquarters at Lancaster, Pa., of which B. W. Tyler, Jr., is supervisor, and W. H. Heims is assistant supervisor. The main line subdivision receiving the highest rating on the Middle division was No. 44, headquarters at Huntingdon, Pa., of which F. H. Lewis is supervisor and K. A. Werden is assistant supervisor; and the best main line subdivision on the Southern division was No. 83, headquarters at Perryville, Md., of which W. T. Bevan is supervisor and J. T. Honker is assistant supervisor.

On the Western region, the main-line subdivision receiving the highest rating was Subdivision 4 of the Ft. Wayne division, of which C. W. Light, Warsaw, Ind., is supervisor. Next in order were Subdivision 3, St. Louis division, M. E. Boyle, supervisor, Greenville, Ind.; Subdivision 1, Cincinnati division, R. W. Riser, supervisor Xenia Ohio; and Subdivision 2, Columbus division, J. N. Sagester, supervisor, Urbana, Ohio.

On branch-line divisions, the prize winning ratings were as follows: Subdivision 1, Chicago Terminal, J. J. Navin, supervisor; Subdivision E, Logansport division, John Nowviskie, supervisor, Crown Point, Ind.; Subdivision 2, Toledo division, C. V. Frish, supervisor, Carrothers Ohio; Subdivision 3, Grand Rapids division, Denis Horgan, supervisor, Cadillac, Mich.; Subdivision 7, Cincinnati division, C. R. McNary, supervisor, Anderson, Ind.; Subdivision 2, Indianapolis division, Mella Ruddick, Columbus, Ind.; and Subdivision 4, St. Louis division, G. L. Bartels, supervisor, Decatur, Ill.

Using Pneumatic Tie Tampers as Ice Cutters

Many switches kept clear in Canadian Pacific yards by the use of standard equipment

DURING the last two winters, the Canadian Pacific has used its pneumatic tie-tamper compressors and tie tampers, that would otherwise have been idle during the winter, in removing ice from the switches in a number of its yards and terminals, to replace other slow and more expensive methods wherever practicable. While the ice removal problem of this road is probably greater than on many roads because of the prolonged and severe winter weather over a large part of its lines, the methods used are applicable on a number of roads.

Problem Severe in Large Yards

The ice problem on the C. P. R. has been particularly severe on the Quebec and Ontario districts, not because of lower temperatures or a greater amount of ice in these districts, but rather because of the larger number of yards and terminals, and the more intensive traffic, involving large numbers of switches and the necessity of keeping them in operating condition at all times. With heavy snowfalls and prolonged cold weather, the accumulation of ice on the track is a natural consequence, even long after the bulk of the snow has been removed. To a large extent this is due to the drip from locomotives and cars, which forms ice immediately upon striking the track, nullifying the effect of even the most effective drainage measures. Where yards are, of necessity, relatively flat, resulting in slow drainage, the ice problem continues even in milder weather, particularly when sleet storms occur or during stretches of alternate thawing and freezing.

More Than a Mile of Air Lines in Glen Yard Make It Possible to Reach 33 Switches with the Tamper Cutters

The problem of breaking up ice on unbroken yard and terminal tracks, or between the switches in such tracks, had been solved effectively on the C. P. R. by the use of air-operated ice-cutting attachments to standard equipment, but effective and economical means for removing ice from switches and through turnouts, particularly at points where a large number of switches were involved and train and engine movements required that they be kept open or freed with the greatest despatch, continued to be a problem. Melting devices were found to be ineffective in most instances, because of drainage difficulties, or the larger accumulation of ice just outside the effective limits of the heaters, which occurred especially in prolonged freezing weather. Almost invariably the section forces turned to the pick and shovel for clearing switches, which, while effective, were slow and costly. This method is still used at outlying points and at places where there are only a relatively small number of switches, but at a number of other points where conditions are severe and there are a considerable number of switches to be kept clean, the picking of the ice is done with pneumatic tie tampers equipped with special ice-cutting tools adapted from standard ballast tamping steels. Air for the operation of the tampers, which is piped through the yards or throughout the territory of the switches to be kept open in two-inch wrought iron pipe, is supplied either from portable tie tamper compressors located at advantageous points and temporarily housed against the weather, or from permanent terminal air lines, supplied from a central power plant, where such lines are located suitably and the plants have sufficient capacity to handle the added load.

Large Installation at Glen Yard

The Canadian Pacific began its first experiments with the tie tampers for cutting ice during the winter of 1929-1930, in its large Glen yard at Westmount, about two miles west of its Windsor station, Montreal. Within this yard, where passenger equipment is held and made up into trains, and where there are more than 100 switches, ice conditions had necessitated the part-time employment of a large force of men 40 to 50 days during the winter. Using picks and shovels, this force, which usually numbered from about 30 to as many as 75 men, required from four to five hours to clean the more important switches.

During the first year of trial of the tie tampers as ice cutters, a 7-in. by 6-in. tie tamper compressor was placed in a small frame house near the middle of the yard, and was connected to a line of two-inch pipe which was laid along the ends of the ties of one of the tracks through the center of the yard, directly alongside the main yard tracks. The supply line was fitted with a number of valves and outlets near switches for convenience in connecting with the tamping tool hose.

The experiments with the tie tampers as ice cutters proved so successful that last year the practice was not only extended at Glen yard, but was introduced also to a number of other yards and points. At Glen yard, where the practice has been used to the greatest extent, over a mile of permanent air lines was installed, with connection to two eight-tool portable tie tamper compressors and to the air lines of the terminal power plant. These lines are equipped with take-offs at suitable intervals, each includ-

ing a hand, globe-type valve and a quick-acting coupling for cutting the tamper hose connections in and out. Through the arrangement provided in 1930, 33 switches within the area of the yard and engine facilities could be reached and cleaned by the tampers.

Teeth Provided on Tamping Bars

The only difference between the tampers used in tamping ties and for cutting ice lies in the shape of the tamping bars or steels. The ice cutting bars were all adapted from worn tamping bars and resemble these bars, even to retaining the characteristic curve at the lower end, except that the tamping head in each case has been swedged down to form a fairly sharp cutting edge somewhat wider than the standard head. Continued experiments in removing ice with the tools indicated that a toothed-edge bar was more effective than the plain

Close-up of a Pneumatic Tie Tamper in Ice Cutting Service

edge, and, all bars were therefore V-notched to form either two or three flat edged teeth.

Retaining the curve at the end of the bar permits the operator to remove ice from the ties with a slicing action, which prevents the splitting or otherwise damaging of the ties. Between the ties there is no special problem, as the cutters break up the ice in chunks which can be removed readily with shovels.

The tamper hose connections for the ice cutting operations are the same as those used when tamping ballast, consisting of ¾-in. hose, except that in some cases they are longer, making it possible to reach several switches from a single tap in the supply line. Ordinarily, the hose lines vary from 50 ft. to 150 ft. in length.

Large Economies Effected

Because of the concentration of switches at Glen yard, the advantages of the tamper for the removal of ice are particularly pronounced, more so than at other points with fewer or more scattered switches. Experience at Glen yard has shown that it is usually necessary to remove ice from the switches and turnouts during about 40 days each winter. This work, which covers principally 33 important switches, was formerly done by a gang of from 60 to 70 laborers and a foreman. Employing the tamper cutters, this same work is now done with a force of 18 men, including a foreman and a compressor operator.

Large as these savings are, they do not include the more or less indirect savings through the speeding up of the ice removal from the more important switches and the lessened damage to the ties. Furthermore, the method employed permits the utilization of the tie tamping outfits at a time when they would normally be idle, which reduces the daily overhead charge on the equipment throughout the year, with direct effect on the unit cost of tie tamping and other work for which the equipment is designed.

Equipment Also Used to Remove Snow

In addition to the use of the tampers for cutting ice, the Canadian Pacific has found that the air supply afforded for this work is particularly suited for blowing snow from switches, and at a considerable saving over the shovel and broom method formerly in use. For this operation, a three-foot length of ¾-in. pipe is fastened to the air hose, the outer end of which is fitted with a plug having a ⅛-in. hole in it. Using this simple arrangement as a blow gun, it has been possible for one man to clear a switch of snow in from two to four minutes, depending upon the character and amount of the snow. In some of the heavier storms of the last two years, one man with a blow pipe head has been able to keep five or six switches open, whereas, formerly, several men would have been required with brooms and shovels.

Automatic Skimmer Gives Oil-Free Effluent

By R. L. HOLMES

Engineer Water Supply, Texas & Pacific, Dallas, Tex.

AN INTERESTING solution of one of the troublesome problems that confront the water service departments of those roads that use oil-burning locomotives has been worked out by the Texas & Pacific. Where fuel oil is used in locomotives, it is practically impossible to avoid wasting a relatively small amount of it, particularly in engine houses and around fueling stations. It is equally impracticable to prevent a large part of this waste oil from entering the drainage systems of the buildings and grounds, unless special provision is made to remove the oil before it can reach the drains.

In urban territory there is considerable danger in allowing any quantity of oil to enter the sewers. In more open sections, the accumulation of waste oil in streams, ponds or marshes which provide the outlet for the drainage usually constitutes a nuisance as well as a potential fire risk. For these reasons a number of methods have been devised for removing the oil before the drainage enters the sewer. While some of them have been reasonably effective, others have not, and few have been entirely satisfactory.

Waste Oil Causes Complaints

The Texas & Pacific began to convert its locomotives to the oil-burning type in 1919 and completed this work in 1920. Soon thereafter complaints began to come in and they soon became so numerous that something had to be done to prevent the waste oil from being carried off of the property. It was found that this oil entered the drainage systems partly with the washings from the enginehouses and partly with the surface drainage during storms.

Inquiry was made of other lines that were then using

oil as a fuel for locomotives, but none of the methods that had been developed on these lines for the removal of oil, was satisfactory for the conditions on the Texas & Pacific. Considerable experimental work was then done, with a view of developing a plan which could be adapted for general application on the system and which would insure the removal of all oil from the water before it reached the sewers. Only one of the plans that were tried gave entire satisfaction. Service since 1922, or over a period of 10 years, has indicated that the plan which was adopted at that time is highly efficient and can be used with complete safety.

Features of Design

At first, the different installations were specially designed for the particular places in which they were applied. It has been found possible to standardize the plans, however, and this was done recently, the accompanying drawing being a copy of this standard plan.

As its name implies, the oil separator and skimmer is a device for separating the waste oil from the drainage water and skimming it from the surface of this water so effectively as to insure that none of it will get into the sewer system or accumulate to cause a nuisance or create a fire risk. The device consists of a shallow open-top concrete chamber which is covered with removable wooden planking or concrete slabs. Running transversely across the full width of this chamber is a series of baffles and weirs. The mixture of water, oil, sludge and grit flows in at one end, the oil being trapped by baffles and the sludge and grit settled out. The water flows over the weirs and, after being freed from the oil, passes to the outlet at the other end. The length of the chamber is fixed approximately by the diameter of the inlet pipe, since the baffles are spaced at intervals of 10 times the diameter of this pipe, while the outlet is three diameters beyond the last weir. Likewise, the width is determined by the rule that the flow over any weir must not exceed 20 g.p.m. for each foot of weir.

How It Works

By reference to the drawing, it will be observed that the baffles are set below the top of the side walls of the chamber and that they have a clearance of 12 in. above the level floor. The first weir has a height of 30 in., which leaves a depth of 18 in. for the accumulation of oil back of the baffle before any of it will pass over the weir. The second weir is four inches lower than the first, which thus provides room for an accumulation of oil which may have passed by the first baffle, to the depth of 14 in. before any of it can reach the outlet.

Skimmer openings, 3 in. high and 24 in. long, are placed back of each of the baffles. The knife-edge bottom of the first opening is 1 in. above the crest of the first weir, while the bottom of the second one is ¾ in. above its corresponding weir. The principle upon which the skimming feature of the device is based is that as the oil accumulates it rises to the surface, displacing a volume of water equal to its own weight. Since the oil is lighter than the water, its surface rises to the point of skimmer overflow before sufficient water is displaced to allow any of the oil to pass under the baffle. If this should happen by any chance, it is trapped and skimmed at the second opening.

These oil skimmers are set above the crests of the weirs to insure that no water will pass over with the oil as it is skimmed. In order to provide free-flowing conditions and to avoid any possibility of the water backing up and obstructing the weir, the outlet pipe should be made larger than the inlet to the skimmer tank.

One wall of the separator chamber, in which the skimmer openings are located, acts as a partition between the separator and the oil chamber, which is designed for the collection and storage of the skimmed oil. The size of the oil storage can be varied to meet different requirements, but under ordinary conditions a capacity of 10 bbl. is sufficient.

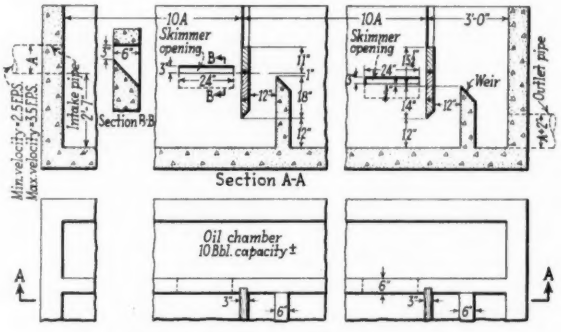
Sludge can best be removed from small separators by means of a scoop. With the larger installations, however, experience has shown that it is more economical to do this with a sludge pump. Where a pump is used for this purpose, it is important that sufficient water be admitted into the chamber through a series of perforated pipes to supply the pump and keep the water at weir height. The pressure in the perforated pipes should be sufficient to agitate the sludge and insure its quick removal from the separator.

Precautions to Be Observed

Experience has also shown that there are a number of precautions to be observed in the design and operation of these skimmers. In the first place, it is important to know the maximum volume of water that must be handled. Satisfactory results cannot be expected if the flow exceeds 20 g.p.m. to 1 ft. of weir.

It is also important that the velocity of approach shall be sufficient to keep sludge and other solids in suspension, but it should not be greater than is necessary to do this, in order to reduce turbulence to a minimum at the entrance to the separator. Where the washings from enginehouses, shops, power plants, etc., carry an unusual amount of suspended matter, or where a large volume of storm water must be handled, a shallow sedimentation basin, located just ahead of the separator, will be very helpful.

A better distribution of the flow through the separator will be obtained if the inlet pipe is placed on the center line of the chamber. Although not so important, it is



Section and Partial Plan of Skimmer Tank

desirable that the outlet pipe should also be laid on the longitudinal axis of the separator. A free outlet is of paramount importance, however. For this reason, the drainage should not be discharged into a stream, pond or swamp that is subject to overflow, unless it is certain that high water will not back up in the outlet pipe sufficiently to overtop the weir in the separator, thus backing the water over the skimmer openings and causing it to overflow into the oil storage.

Frequent inspections should be made to insure that there is not a sufficient accumulation of sludge under the baffles to restrict the flow. There should always be sufficient waterway to prevent the water from rising higher back of the baffles than the crest of the weir.

Specialized or General Work for Bridge and Building Gangs?*

Report based on a study of the relative merits of "separate" and "combined" gangs for routine maintenance of railway structures

THE committee was asked to study the relative advantages of separate and combined gangs for bridge and building work, and to determine if possible the conditions under which each is advisable. Generally speaking, the committee's interpretation of a "separate" gang is one which is organized to do but one or a few lines of work, for example, a crew which moves over its territory equipped to do nothing but place timber in bridges; while a "combined" gang is one which is equipped and organized to handle practically all bridge and building work in its territory.

At the very outset it was aparent that a wide variance of opinion existed among the railroads as a whole and even among the committee members. It was agreed that on certain kinds of construction or maintenance a combined gang could be used to better advantage, while on others the reverse is true, or that in other words both kinds of organizations are not equally adapted to all work. However, the most surprising fact developed in the investigation was that maintenance officers on railroads of similar physical characteristics, with equal and similar experience, were not infrequently of directly opposite opinions as to the kind of bridge and building gang, viz., "separate" or "combined," that was the most economical. Where one officer would insist that a certain feature favored one system or the other, another officer would be equally insistent that this very same feature actually constituted a disadvantage. With a situation of this kind it became quite impossible to set forth any hard and fast rule in favor of one type of gang or the other. Consequently, the committee feels that this report should present the advantages and disadvantages of each type of organization, leaving it to each maintenance officer to select that kind of gang that best meets his requirements.

The committee personnel includes officers of ten major railroads in the United States and Canada and is representative of all parts of the continent. Inquiries were made concerning the recommended practices of 30 railroads exclusive of those represented on the committee, and although responses were not received from all of the roads addressed the committee did secure the opinions of about 40 maintenance officers. It is interesting to note that of these, 65 per cent favored the combined gang, while 30 per cent favored separate gangs, a ratio of about two to one. A few qualified their statements. The committee members are about evenly divided in their views.

In spite of this variance of opinion, it is felt that there are conditions under which there should be little hesitancy in selecting the proper type of gang organization. For example, railroads with limited mileage and without large or important terminals can undoubtedly use the combined gang to advantage, as ordinarily there is not sufficient work to keep several gangs busy throughout the season on specialized work. Furthermore, railroads whose buildings and bridges are largely permanent structures can probably employ the combined gang most economically, as the work will generally consist of minor repairs of several classes. This would not permit the assigning of highly specialized gangs because of the necessity for too frequent moving, too many crews and men, and too large an investment in special equipment.

The Combined Gang

Those who favor the combined gang were unanimous in stating that it is preferable because it cleans up all work as it progresses. Obviously, there is also a saving in the traveling time of the gangs and in avoiding an overlapping of their movements. The men themselves become familiar with the characteristics of their own subdivision or territory and are, therefore, prepared to observe where special attention is needed. This applies also to the annual inspection, for the local foreman should accompany the inspection party to assist in outlining the next season's work. It is also maintained by advocates of the combined gang that such an organization tends to develop more capable foremen, it being their contention that foremen should not be specialists. They contend also that this plan calls for less fluctuation of seasonal labor requirements. It appeals to several on account of its tendency to promote better morale among the men. Naturally, with a smaller territory it is possible for the members of the crew to visit their homes more frequently on week ends and holidays without loss of time. Finally, individual responsibility and pride of the foreman and crew should tend toward improved quality and thoroughness of work.

On the other hand, the combined crew has several disadvantages, some of which would appear to be directly contradictory to the advantages listed above. The combined gang cannot attain 100 per cent efficiency because the varied nature of the work too often makes it necessary for the men to perform tasks with which they are not entirely familiar. The old appelation, "Jack of all trades—Master of none," is perhaps directly applicable to the average member of a combined crew. Furthermore, a great stimulus to high production is afforded by a comparative statement in which the performance of one crew is compared with that of another on a man-hour or

*This comprises an advance printing in abstract of a report prepared by a committee of the American Railway Bridge and Building Association for presentation at the convention which was to have been held in October, 1931. Because this convention was postponed until October, 1932, the association has authorized the publication of this report in *Railway Engineering and Maintenance*.

The personnel of the committee is: H. C. Munson, chairman (C. M. St. P. & P.), K. Peabody, vice-chairman (N. Y. C.), J. Ferguson (C. N.), A. N. Reece (K. C. S.), S. C. Tanner, (B. & O.), T. B. Turnbull, (A. A.), L. A. Warren, (S. P.), J. J. Wishart (N. Y. N. H. & H.), J. P. Yates, (M. P.)

Copyright, 1932, by the American Railway Bridge and Building Association.

other unit basis. Such a comparison is difficult if not impracticable with gangs performing miscellaneous tasks.

During the last few seasons the necessity and importance of the detailed programming of the work assigned to bridge and building crews has been emphasized, and the same features which render comparison difficult also tend to reduce the possibility of an accurate and concise program. Loss of time, also, results from the reorganization that is necessary when a crew completes a bridge project, for example, and is about to begin miscellaneous repairs on a stock yard or depot. Again, with men working on projects with which they are not entirely familiar, the hazard of personal injury is increaesd.

The Separate Gang

Generally speaking, a feature which constitutes an advantage for the combined gang should be a disadvantage for the separate gang, and conversely; but inasmuch as this is not literally true the separate gang organization will be analyzed in the same manner as the combined gang has been in the preceding paragraphs. It is generally agreed that separate gangs are able to perform their more specific duties with greater dispatch and efficiency. Other things being equal, this should, of course, result in a lower cost per unit of output and a greater uniformity in the character of work performed.

When gangs are assigned to a given class of work, it is easier to program the work in detail and to make a closer comparison of the efficiency and output of two or more crews performing similar service, thereby creating a lively spirit of rivalry between crews and men thus compared. There is no disrupting of the organization, such as occurs when the work is varied, as each man understands exactly what is required of him as quickly as the crew sets its feet on the ground. Since such crews cover a territory of many miles, often several divisions, it follows that fewer units of expensive equipment will be required and such equipment will be in more continuous use. Such a system affords opportunities for the stores and purchasing departments to economize in the disbursing and handling of material. Again, the hazard of personal injuries is decreased as the men are more thoroughly alert to the dangers of their particular work and will protect themselves and others more effectively.

The disadvantages of the separate gang are not so numerous. Ordinarily, such a crew is not equipped or organized to make miscellaneous repairs which might arise but which should be avoided if at all possible. Such a system does not afford the same opportunity for the training of men for positions as bridge and building foremen as they will not have the well-rounded experience of men who had worked in combined gangs. Unquestionably the separate organization produces a greater seasonal labor turnover, but there is no particular reason why this could not be avoided if desired.

Several maintenance officers object to the separate organization because of the delays that may be encountered in dispatching the gang to certain jobs. The principal objection to the separate gangs, offered by the sponsors of the combined gangs, is the tendency it has toward excessive traveling by crews and the cross hauling of equipment, with an alleged loss of productive time.

Personal Views of the Chairman

Inasmuch as each maintenance man bases his opinions on such matters almost entirely on experiences and observations on his own railroad, the chairman is assuming that it will be in order for him to make certain observations on the experience of his own road, which he believes is a pioneer in its method of programming the maintenance of bridges and buildings. Incidentally, it is with the express purpose of pointing out the advantages of the separate gang and its possibilities that these features, as observed on this railway, are pointed out.

During the season of 1929 two or three divisions of the railroad with which the chairman is associated were selected for the conduct of an experiment with a highly exacting program of bridge maintenance. As this was not an established organization, only the divisions with heavy bridge programs were selected, no attempt being made to program building and other maintenance work except building painting, the latter having been handled in this manner for several years. The new system contemplated separate gangs in the truest sense of the word. For example, on bridge maintenance a gang assigned solely to the driving of piles is followed later by another gang which does nothing but place bridge timbers where piles have been driven or renew floors on other pile bridges or steel spans. During the course of the annual inspection, the amounts of labor and material required for each job placed in the budget are estimated in detail, and the program for the year's work is developed so thoroughly that it is possible to determine at a glance where each crew will be several months hence, or the exact day on which the work of the season will be completed. Such gangs sometimes travel off the division, if they are properly located to save deadhead mileage; in fact, all jobs are so located and selected as to keep the crews working continuously. One modern pile driver suffices for several divisions, and one fully-equipped gang covers a surprising number of miles. The schedule or program of the gangs is such that requisitions placed on the stores department specify the exact date on which material must be delivered to each job. It is loaded on system cars which are held under load until unloaded out-of-face by the gang at one point after another in accordance with the schedule. The gang later works back over the territory where the material has been distributed.

Excellent Results Obtained

The results are surprising. The men are keyed up to such a high pitch of enthusiasm that the close of each day finds them discussing the day's activities, comparing their actual cost and efficiency record with the program. They are anxious to "beat the other fellow" and as a result the output per man-hour is increased tremendously. The saving of hundreds of thousands of dollars on work carried out in accordance with a program embracing only a portion of the railroad justified an expansion of the plan so that the new system is now applied more extensively with marked success. For details of the organization, the reader is referred to pages 544-550 of the June, 1931, issue of *Railway Engineering and Maintenance.*

The point of importance, so far as this committee's report is concerned, is this: Such an exacting program could not, in the chairman's opinion, be prepared, maintained and compared for a combined gang, although as previously stated, this view is not held by all who were consulted by this committee or by all of the members of the committee. It is not the purpose of his report to dwell at length on programming, as that subject was covered in a committee report presented before the association in 1930; however, programming is so closely associated with the subject assigned to this committee that the two must be considered together if a true picture of the real situation is to be obtained.

Does Our Organization Meet Today's Conditions?*

Burlington increases size of gangs—Relieves them of track patrol—Gives foremen more supervision

By H. R. CLARKE

General Inspector Permanent Way, Chicago, Burlington & Quincy, Chicago

A DRASTIC reorganization of the division maintenance of way forces is now in progress on the Chicago, Burlington & Quincy. While these changes are being made partly in the interest of economy, observation over the limited time that the plan has been in effect indicates that the effectiveness of the forces has been increased and that the supervision is not only of a better quality but that it is more intensive.

On the La Crosse Division of the Burlington

From the beginning, the section gang has remained the primary unit in the maintenance organization. The organization of the larger gangs and the scheduling of their work have not been difficult, but the section gangs have presented a more serious problem owing to the nature of their work and the varied tasks which they are called on to perform. Different solutions of this problem have been worked out on different roads. A few believe in a uniform section force and, so far as practicable, maintain such a force. This practice is not feasible on many roads, however, because climatic conditions make it uneconomical. On some roads the section gangs have been reduced to skeleton units, and practically all track maintenance is performed by larger special gangs. The Burlington has never accepted this theory of maintenance, as we do not believe that it is possible to put track in such condition that it can be neglected for a year or more until the special gang can again overhaul it.

It had been obvious for some time that a reorganization of the track forces was becoming necessary, from the roadmaster to the section gang. With the almost universal use of the track motor car; the increase in the strength and stiffness of the track structure which has occurred in recent years; improved drainage, better ballast and wider roadbed sections; the use of treated ties, which has more than cut in half the number of ties required in renewals; the use of chemical weed destroyers, weed burners and machine mowers; and other labor-saving developments, the number of men required in routine maintenance has decreased steadily. As a result, there has been a gradual lengthening of sections to seven and eight miles. During this time, however, the standard of maintenance has continued to rise as the man-power per mile of track decreased.

Gangs Became Too Small

To meet the conditions with which we were confronted on many parts of our road, an average eight-mile section had an allotment of two to three men. This, in itself, forced a reorganization, since such work as lining track, changing rails, etc., cannot be done by so small a force, while there is much other work that can be done to better advantage by a gang of sufficient size to allow a proper organization and distribution of the men. A careful study indicated only one solution—the lengthening of the sections to obtain fewer but larger gangs—since an increase in the number of trackmen was impracticable.

As a result of this study, a plan was worked out which increased the average length of the sections about 50 per cent, or from 8 miles to 12 miles. This was not done arbitrarily, each line and section being studied in detail and the adjustment made to fit conditions. In some cases the increase was less than 50 per cent, in others the length was doubled. This rearrangement resulted in a reduction of one-third in the number of sections, with a corresponding increase in the number of men to a gang, since no reduction was made in the number of trackmen, this being a fundamental feature of the plan.

Foremen Relieved of Patrol Duty

Daily track patrol, nearly always by the foreman himself, has always been considered necessary by the Burlington and still is. But to eliminate lost motion and provide more time for productive work, the foreman has been relieved of this responsibility. A new position, that of track supervisor, was created and the supervisors were charged, among other duties, with that of making daily inspections of the track. With the added supervision thus provided, it was possible to increase the mileage of the roadmasters' divisions. Heretofore, a roadmaster's territory on main line has embraced from 100 to 150 miles of line or a freight district, and sometimes included a short branch line. Under the new plan, our roadmasters are given two engine districts or about 200 to 250 miles of line.

The reorganization was put into effect on one division at a time, since the foremen are allowed division seniority. Those who were displaced by the consolidation of the sections were located in accordance with their preference and seniority. The bids for location were all

*Abstracted from a paper presented before the Maintenance of Way Club of Chicago on December 16.

received at one time under an agreement with the men, so that the reassignment might be made as quickly as possible and with a minimum disturbance to the men.

A comparison of the two organizations on a typical main-line division, which includes three yards, is of interest:

	Former Organization	New Organization
Mileage, all main line	353	353
Number of roadmasters	3	2
Number of supervisors	None	5
Number of foremen	52	30
Average length of section	6.75 miles	11.70 miles

The actual reduction in payroll on this division amounts to $31,495 a year. Later, by a further consolidation, the roadmasters' territories were extended to 225 and 250 miles, respectively, instead of 175 miles as at first.

A slightly different plan has been followed on branch lines. Sections were lengthened but not in the same ratio as on main lines since they were already longer. Supervisors were not placed on branch lines and roadmasters' districts were not lengthened. Forces are much more limited and daily patrol of the track is not required. For these reasons it was believed that the same intensive supervision was not required.

A similar comparison of a division which comprised 430 miles of main line, 430 miles of branches and 6 yards shows the following changes:

	Former Organization	New Organization
Mileage	860	860
Number of roadmasters	5	4
Number of supervisors	None	6
Number of foremen	106	74
Average length of section	7.24 miles	10.39 miles

In this case an annual reduction of $40,901 was made in the payroll.

Administrative Advantages

The important feature of the plan from an administrative point of view is that it relieves the roadmaster of much time-consuming detail and permits him to concentrate on the larger operations on his district, such as handling work trains, laying rail, ballast renewal and general planning, without routine matters being neglected. He is still the responsible maintenance officer—to a greater extent now than before. The supervisors are his assistants to carry out the details of his plans.

The supervisor is the keystone of the plan, however; the results obtained depend largely on him. Supervisors are given jurisdiction over about 75 miles of line or six gangs. They are provided with light inspection motor cars which are fitted with side seats that are so arranged that they always face forward. They are also provided with very accurate combination track levels and gages. They carry, in addition, such other tools as they and the roadmasters deem necessary. A supervisor is expected to cover his territory in one direction every working day, making a close inspection of every condition of roadway and track. This relieves the foreman of this duty and permits him to devote to productive work the time formerly spent in going over his section.

Supervisors See Every Foreman Every Day

Supervisors are allowed an expense account as they are on the line constantly. They report to the roadmaster and are relieved of all correspondence and administrative duties. They have direct supervision over the section foremen and see every foreman every day. They spend some time with each foreman but are expected to give more time to the less competent foremen, helping them plan their work, organize their gangs and, in case of need, actually handling the gangs themselves for a time to do such work as lining, etc. While the foremen are encouraged to take the initiative in planning their work, experience has already shown that the more frequent contact brought about by the daily visits of the supervisor has resulted in more uniform methods.

While the foremen are relieved of the responsibility for routine inspection, they are expected to examine their track as they pass over it in going to and from their work. They are also held responsible for taking the necessary action during storms or other emergencies.

Plan Applied Progressively

The plan was first put into effect on one division of the Colorado & Southern about two years ago and extended gradually to include all of the lines of that road, part of the Ft. Worth & Denver City, and one division of the Chicago, Burlington & Quincy. The results were so favorable that as fast as the necessary studies could be made it was extended on this road until it is now in effect on all of the lines west of the Missouri river and part of the lines east. It is our intention to continue the reorganization in 1932 to include all of the mileage on the system.

Since the plan involved such radical changes in the established organization, it was natural that the division officers should be somewhat skeptical of results. For this reason, it is interesting to note that nearly all of those officers, who are closest to the firing line and who are responsible for results, are now in favor of it and mention as advantages the particular features which were in mind when the plan was developed. As already mentioned, these include the marked increase in productive time on the part of the foremen through the elimination of patrol duty, more intensive and uniform control of the work as a result of the daily contacts by the supervisors, the better organization and greater productive output of the individual trackmen as a consequence of the larger gangs, and an increased interest and more initiative on the part of the foremen. Roadmasters are also better able to adjust their forces to meet local conditions than was possible with the larger number of smaller gangs.

Results Up-to-Date

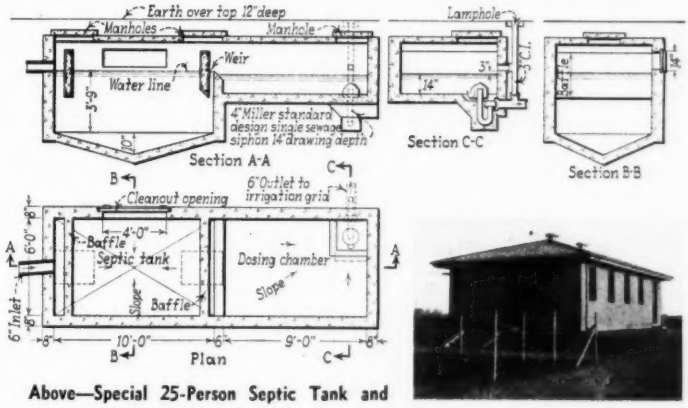
The use of power equipment by section gangs was given little consideration in the studies that were made, since it is our practice to perform the larger operations of laying rail, renewing ballast, heavy ditching, etc., with gangs specially organized for this purpose. These gangs will be of such size as will permit them to obtain the largest use factor of the power equipment with which they are provided. The primary purpose of the reorganization was to increase the effectiveness of such forces as we were working under present conditions and, as a corollary, to bring about further economy if practicable.

The actual payroll saving is a very substantial one. If we can hold our own, keeping our standard of maintenance at its present level, the saving is actual. If we are able to improve in this respect, the savings will be greater than that indicated by the payroll reductions. If we are unable to maintain our present standards, we have no intention of allowing preconceived ideas to blind us to facts. As yet it is not possible to say definitely what the ultimate results will be. So far, the division officers all report favorably, saying that they have already accomplished more than would have been possible under the former organization of the maintenance forces.

Providing Sanitary Facilities for Outlying Points

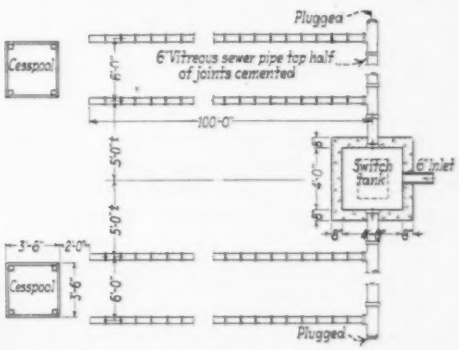
To meet the problem where public sewers are not available, the Southern Pacific has developed designs for septic and filter beds to care for 25, 50 and 75 persons

RECOGNIZING the septic tank and filter bed as the most sanitary, effective and economical means of disposing of sewage where there are no sewers, but where a water supply is available, as is usually the case, the Southern Pacific has adopted this method of disposal extensively, using it in preference to the less effective and less permanent cesspool type of disposal system unless the installation is made only to meet temporary conditions. Experience in the installation of septic-tank systems indicated clearly the economy of using commercial type septic tanks in systems provided at points with relatively small requirements, but led to the design of special, constructed-in-place, reinforced concrete septic tanks for use at points where the sanitary systems are called upon to serve from 25 to 75 people. Several of these larger tanks have been constructed, the principal points of installation being at shops and engine terminals, and in connection with housing facilities.



Above—Special 25-Person Septic Tank and Dosing Chamber. At the Right—Plan of Typical Sub-Soil Filter Grid and Switch Tank Used with Septic Tank

In the Center—A Corner of One of the Fence-Enclosed Depressed Filter Beds Serving the Terminal Wash and Locker Buildings at Fresno, Cal.



Constructed in Three Sizes

All of the tanks are substantially similar in design, but to meet specific or anticipated demands, they are built in three sizes, to accommodate 25, 50 or 75 people. Since, however, most of the tanks constructed have been of the two smaller sizes, and since, in all probability, these sizes are also suited to more general application on other roads, details of only the two smaller sizes are given in this article. All of the specially designed septic tanks which have been installed thus far have proved highly effective from the standpoint of sanitation and the older installations demonstrate that they give long, continuous service without attention of any kind. The tanks are, however, inspected at intervals of approximately one year as cleaning eventually becomes necessary.

Essentially, the tank is a reinforced concrete structure, rectilinear in shape, with two main parts; a septic chamber and a dosing chamber, the former provided for septic action to take place, and the latter solely for the accumulation of the effluent into a dose of predetermined volume for flooding the filter system. In the design to accommodate about 25 people, the tank has an overall length of 20 ft. 10 in. and an overall width of 7 ft. 4 in., these dimensions including 8-in. side and end walls.

The septic basin, or chamber, is 10 ft. long by 6 ft. wide and ranges in depth from 5 ft. 6½ in. at the sides to 6 ft. 4½ in. at the center, the bottom sloping downward in all directions toward the center. The inlet to the chamber is a 6-in. pipe opening, 3 ft. 9 in. above the highest point in the bottom, and outlet from the chamber is over a concrete wier, at a similar height above the bottom, directly into the dosing chamber. A concrete baffle in front of the inlet retards the force of the incoming waste and directs it downward into the body of the chamber where the sludge settles to the bottom and is attacked by anaerobic bacteria, the principal disintegrating agency in septic tank decomposition. A concrete baffle set back 4 in. from the wier outlet and extending to a depth of 18 in. below its crest, prevents skimming of the contents of the chamber with the likely fouling of the wier crest which would result, and also prevents the matter which forms on top of the contents from entering the dosing chamber and clogging the syphon and filter grid.

The dosing chamber is 9 ft. long by 6 ft. wide, and is provided with a reinforced concrete bottom, 6 in. thick,

the upper face of which is 14 in. below the crest of the wier regulating the flow into it. This design permits a maximum depth of effluent of 14 in. in the chamber, which is sufficient to operate a 4-in. Miller single sewage syphon with a 14-in. drawing depth, provided in the chamber at the end opposite the wier. Through the action of the syphon, which is automatic in operation, the effluent is discharged from the chamber into the filter system in doses amounting to about 475 gal. each, following each of which the syphon prevents discharge until 14 in. of head has again been built up.

In order that the septic tank as a whole will be as air-tight as possible to afford the most favorable conditions for bacteriological action, it is covered over with a reinforced concrete slab, 4½ in. thick, on top of which earth is mounded to a depth of at least 12 in. Three manholes are provided in the cover to afford ready access to the tank for cleaning or inspection; one over the inlet, another over the wier, and the third over the syphon outlet. All of these openings are provided with concrete slab covers, which are themselves covered with earth like the main body of the tank. In order to make it possible to observe readily whether the syphon is functioning properly, a lamp hole, consisting of 5 in. cast iron pipe, is connected into the discharge line just beyond the syphon, outside of the tank, and is carried up to the ground level where it is provided with a cap. A 3-in. cast iron pipe by-pass from the dosing chamber into the observation pipe, at a height of about 16 in. above the bottom, provides for overflow of the dosing chamber into the outlet pipe in the event that the syphon should become inoperative for any reason.

A further opening for cleaning purposes is provided in the side of the septic tank, just above the water line. This opening is closed normally with a redwood plank door held in place by the surrounding earth.

Details of 50-Person Tank

The 50-person septic tank is of fundamentally the same shape as the 25-person tank described, differing principally in dimensions. This tank is 33 ft. 10 in. long by 8 ft. 4 in. wide, with the two chambers each 16 ft. by 7 ft. The inside depth of the septic chamber is 6 ft. at the sides and 7 ft. 8 in. at the center, while the depth of the dosing chamber is about 2 ft. 10 in. The depth of liquid in the septic chamber is limited to 4 ft. 3 in. above the highest point in the bottom, by the height of the wier regulating the flow into the dosing chamber, and the depth of effluent in the dosing chamber is limited to 14 in. by the provision in this chamber, as in the case of the chamber of the 25-person tank, of a 4-in. Miller single sewage syphon with a 14-in. drew.

While 14-in. syphons have been mentioned in the description of the two sizes of septic tanks, the actual drawing depth of the syphon selected in each case depends upon conditions found at the point of installation. Where the natural fall in the ground is small, a syphon of minimum drawing depth is selected. Where the natural fall, on the other hand, is great, a syphon of greater drawing depth leads to economies in the construction of the dosing chamber.

A special feature usually incorporated with the larger size tank is a float gage in the dosing chamber, which consists essentially of a 9-in. copper ball float connected to a vertical rod which extends up through the top of the tank and the earth cover to a 4-in. gage ball. The action of this gage shows definitely whether the sewage syphon is functioning properly, without resorting to inspection through the lamp hole. For correcting any trouble, which may arise, or for cleaning, four manholes are provided in the cover, three of which are in the same relative positions as those in the 25-person tank. The fourth manhole is directly over the center, or deepest part, of the septic chamber, and is provided mainly to make cleaning easier and more effective than would be possible from the end holes. A side opening into the septic tank for cleaning purposes is also provided, as in the case of the smaller tank.

Open Joint Tile System

Because of the greater degree of sanitation afforded, and, in some instances to make it safer where there is the possibility of contaminating ground water used for drinking water supplies, the usual method employed in disposing of the effluent from the septic tanks is through a filter bed or leaching field. The type of filter bed used with the septic tanks of the different sizes is identical and differs only in extent, that employed with the 25-person tank usually extending over an area of about 22 ft. by 100 ft., and that with the larger tank extending over an area of about 60 ft. by 100 ft.

The effluent from the dosing chamber is carried away in a 6-in. vitrified tile pipe with bell joints, to a manhole, or switch tank as it is called, from which it is distributed to the filter system. The filter system consists of two main leaders of 6-in. vitrified, bell-joint pipe, extending from opposite sides of the switch tank, from which 100-ft. laterals extend at right angles at intervals of 6 ft. In the case of the larger system, a total of ten parallel laterals is usually provided, five on each side of the switch tank, while in the case of the smaller system, four laterals are usually sufficient. In all cases, the laterals consist of 4-in. drain tiles, laid with ¼-in. open joints, and are provided with a 2-in. fall.

Specifications for the installation of the filter beds call for the plowing of the entire surface of the drainage area to a depth of at least 12 in.; the provision of at least 12 in. of crushed rock or gravel about the tiles in all directions, graded from coarse stone immediately about the tiles to fine stone at the edges; and a relatively thin loose earth cover over the tile lines to permit ready aeration of the filter bed. In fact, the entire surface of the drainage area is cut down to a maximum height of 24 in. above the bottoms of the lateral tile lines, which, in many cases, requires considerable excavation from the drainage area and results in a depression of the normal ground level throughout its extent. The depth of this depression is determined by the depth to which it is necessary to lay the tile lines in order to secure gravity flow of the effluent from the septic tank, and by the maximum cover permitted over the lines. Where this depression occurs within the limits of a terminal, or at other points where it might be an obstruction or a hazard to the movement of employees or other people, the filter bed area is enclosed by a high steel wire fence. Such a fence not only acts as a safety factor but also to prevent compacting of the surface of the filter bed by traffic.

Experience on the Southern Pacific with the type of sewage system described has proved that the system is practically permanent and as near the ideal in sanitation as can be secured where sewer connections are not available. Maintenance and attendance are practically nil and cleaning of the septic tank is necessary only at intervals of from eight to ten years, depending upon the demands made upon them.

The special design of septic tank employed was designed by L. E. Peyser, assistant architect of the Southern Pacific, under the direction of J. H. Christie, architect, and W. H. Kirkbride, engineer maintenance of way and structures.

What's the Answer?

Have you a question you would like to have someone answer?

Can you answer any of the questions listed in the box?

To Be Answered in March

1. When distributing crossties, should they be stacked in small piles or placed singly at the points where they are to be applied? If the latter, how long before use is this distribution permissible?

2. What is the limiting depth (pumping level) for the operation of reciprocating deep-well pumps? What establishes this limit?

3. To what extent can ditches be standardized? What effect, if any, does such standardization have on track maintenance?

4. To what extent is it practicable to preframe both treated and untreated timber for trestles? What are the relative advantages and disadvantages of doing so?

5. From the standpoints of maintenance and operation, what is the most desirable degree of curve? In what way, if any, is this affected by speed, traffic density, character or traffic or type of ballast?

6. Where paved areas around stations and freight houses are too wide to permit the usual form of street crowning, what provision can be made for drainage?

7. Under what conditions, if any, is gage wider than 4 ft. 8½ in. permissible? How wide may the gage be allowed to get before regaging is required?

8. What methods can be employed to determine the loss of section in bridge members that have been subjected to severe corrosion?

Cost of Replacing a Rail

How much does it cost to replace a 39-ft., 100-lb. rail in track? Also one weighing 130 lb. to the yard? What considerations enter into this cost ?

Cost Is Influenced by Conditions

By G. D. MAYOR
Assistant Cost Engineer, Chesapeake & Ohio, St. Albans, W. Va.

The cost of replacing single rails is determined more by the distance that the new and discarded rails must be trucked than by any other single factor under normal conditions. There is also the question whether the adjacent rail must be driven back to allow for expansion when the old rail is removed. The latter consideration will be ignored in the discussion. A section force consisting of a foreman and five men can handle a 130-lb. rail as easily as they can one weighing 100 lb. to the yard, and at no difference in cost.

In making the replacement the entire crew loads the new rail on a trailer car, hauls it to the point of installation, unloads it and sets it up on the ends of the ties. Two men are then sent to flag and the remainder of the force lines out the old rail and shoves the new one into place, full-bolting and spiking it. The flagmen are then recalled and assist in loading the old rail and unloading it on the scrap pile.

As shown by several years' records, the average cost is $1.344 for replacing the rail after it is on the ground. If it is loaded on a trailer and towed to the point of use, the transportation cost is $0.252 a mile. Handling on a push car by hand is far more expensive, averaging $1.260 for every mile trucked, a larger force being necessary in this case. The latter figure is based on a foreman, 2 flagmen and 6 laborers, the use of the hand truck being confined to yards except in rare instances.

Several Factors Determine Cost

By C. W. BALDRIDGE
Assistant Engineer, Atchison, Topeka & Santa Fe, Chicago

In giving an answer to this question several factors must be considered, a variation in any one or several of which will give a different result. The major factors are: The value of the rail that is to be installed as compared with the one that is to be removed, the hourly rate of labor, the time required to make the replacement, and the availability of the necessary number of men.

It is assumed that the labor cost is what is desired. The factors that enter into this cost are: Transportation of the rail from the nearest rail rest, this should not exceed one mile; pulling one row of spikes; removing two sets of joint fastenings; throwing out the old rail; placing the new one into position; respiking; applying the joint fastenings and rebolting; removing the old rail to the storage point; flagging and supervision; and travel of the men to the point of renewal and the return trip to other work.

If there are sufficient men in the one gang to make the replacement and assuming a rate of pay of 37 cents an hour, the average cost of removing one 39-ft., 100-lb. rail and replacing it will be approximately $4. This includes consideration of all of the factors mentioned. If, however, the cost of replacing the emergency rail on the rail rest is included, and if it is necessary to bring men from adjoining sections, or the cost of shipping the rail to some central point for examination or disposal is

also included, the cost will be from $6.50 to $7.

The cost of replacing a single 130-lb. rail should be little if any greater than that of replacing one weighing 100 lb. to the yard. If more men are required to handle the heavier rail, the greater cost per unit of time will be largely offset by the fact that they will do the work other than transporting the rail more quickly.

Within Limits, Weight Does Not Alter Cost

By R. ROSSI

Yard Foreman, Alton, Chicago

Within the limits of weight assumed by the question, there should not be and rarely is any difference in the cost of replacing a rail. It is obvious, of course, that the cost of replacing a single rail is entirely out of proportion to the cost of replacing the same rail as part of a general program of rail renewal, although identical operations are performed in each case, except the trucking of the rail.

Eliminating the trucking from consideration because the cost of trucking is highly variable, and assuming that the rail is set upright on the ends of the ties, four men can make the replacement in 30 min., representing a total of two man-hours. At 40 cents an hour, the cost will be $0.80, to which the cost of flagging, 1 hr., must be added. If six men are employed, they can do the work in 20 min., again two man-hours, the cost being the same as before. The total cost may vary widely from this figure, however, since the cost of handling and trucking the new and old rails to and from the work must be included, while it may be necessary to transport the men a considerable distance from and to other work.

Failure in Treated Timber

What forms of failure occur in treated stringers, caps and sills? What are the evidences, if any, of approaching failure ?

Crushing Is Usually the First Sign

By D. RINTOUL

General Bridge Inspector, Southern Pacific, San Francisco, Cal.

Creosoted Douglas fir and Louisiana pine were used extensively by the Southern Pacific for stringers, caps and sills as well as for other members in ballast-deck trestles during the period between 1894 and 1900. In the latter year the use of creosoted stringers was discontinued until 1915, since which time their use has been continuous. We have thus had 37 years of experience with treated caps and sills and a more restricted experience with treated stringers, but for the same length of time. This explanation is made, because the structures that were built in the six-year period ending with 1900 are the only ones in which extensive failures of creosoted timbers have occurred.

Approaching failure of caps and sills in these early trestles has been noticed first at the bearing points of the posts where crushing begins in the horizontal members. This progresses slowly or rapidly somewhat in proportion to the traffic until the member is weakened to such an extent that it must be replaced. Caps and sills often develop additional weakness by splitting during the progress of the crushing.

We have found that this crushing effect is almost invariably the result of insufficient bearing area of the supporting members. No crushing action was ever observed in caps or sills until the axle loads had advanced far beyond the designed capacity of the structure. For this reason the crushing of caps and sills can often be retarded and the life of the members prolonged by the installation of additional posts.

Likewise, approaching failure in creosoted stringers has been apparent when crushing has been observed at the end bearing where they rest on the caps. Repeated compression of a member by the superimposed axle loads, when it occurs close to the end of the timber, tends to separate the wood fibres. Following this, definite checks appear at the end of the stringer, and these extend gradually until the deflection of the member becomes so great that it must be replaced or reinforced.

Failures in creosoted stringers, like those in the caps and sills that have been mentioned, has been attributed to the same cause. No failures have occurred until the members have been overloaded, after which the progress may be slow or rapid, depending on the relative increase in the axle loadings.

Failures Occur in Several Ways

By Engineer Maintenance of Way

Several forms of failure have been observed in the treated members of both open and ballast-deck trestles. The form in which the failure occurs depends on the cause, and the most frequent cause is decay, the very thing that the treatment is intended to eliminate or retard. The causes of decay in treated timber are generally easily determined and the means of correction are not difficult of application.

Probably the most frequent cause of decay in treated timber is improper handling or abuse. Except in rare instances, complete penetration of a dimension timber by the preservative cannot be justified, nor is it desirable for several reasons. Excluding special cases, every treated timber is comprised of an outer shell of treated wood and an inner area that is untreated. As long as this outer shell remains unbroken, the inner area is immune to decay.

Where treated timbers are handled with cant hooks, holes are bored for bolts, ends are sawed off or surfaces are adzed, the way is opened for the entrance of decay-producing spores into the untreated area. Where stringers are framed in the field and adzed for a bearing or drifted to the caps, decay will begin on the exposed surfaces of the untreated wood and extend within the shell until crushing of the decayed fibres occurs. The same thing occurs in caps and sills that are framed and bored in the field. The remedy is to preframe all treated timber and strictly prohibit cutting and boring after treatment.

One of the most aggravating forms of failure is that which occurs in timber that has become infected prior to treatment, in which event decay may extend all through the piece. The field handling may have been entirely correct, but after a period, sometimes a year or more, crushing occurs, usually, but not necessarily, over or under the bearing points. It may progress slowly for a time or the failure may take place quickly with little warning. Fortunately, better sanitary conditions during seasoning have largely eliminated this form of failure.

There remains one major form of failure which should be mentioned—horizontal shear. This occurs more frequently in stringers, but has occurred in caps and sills and in ties on both open-deck trestles and steel spans. Overstressing the stringers for a long period is a frequent cause of horizontal shear. It may start from seasoning checks which work progressively toward the

neutral axis, extending along this axis until failure is imminent. Twenty or 30 years ago many failures of this type were attributed to over-steaming of the stringers prior to treatment, but this cause has nearly, if not entirely, ceased to be a factor.

—x—

Winter Switch Inspection

What special precautions or methods, if any, should be employed in the inspection of switches in the winter, which are not necessary at other seasons ?

Preparedness Pays Large Returns

By W. H. SPARKS
General Inspector of Track, Chesapeake & Ohio, Russell, Ky.

Fundamentally, there are no methods of winter switch inspection which differ from those which should be followed at other seasons, though some of the details may be different. There are a number of precautions which should be taken, however, some of which are not necessary and others of which are not of equal importance during the period when the ground is free from frost and snow. As a matter of fact, a great deal of winter switch work should be done in the fall just prior to the approach of winter. This sort of preparedness not only costs less when done at this time, but will pay a large return on the effort.

To begin with, switch inspections should be rigid and thorough at all seasons. First-class line, surface and gage are as important in summer as in winter. The work required to put a turnout in good condition with respect to these items is so much less and so much more easily accomplished before the ground freezes that there should be no excuse under normal conditions for allowing a turnout to enter the winter in poor condition. Again there is no purpose served in making inspections unless defects that may be found are corrected as quickly as possible. For these reasons, the late-fall switch inspections should be particularly thorough, and they should be followed up to insure that all defects of whatever character are corrected.

At this time the ballast should be removed well below the tops of the ties throughout the full length of the switch points, frogs and guard rails. An important precaution is the filling of all depressions and holes and the removal of loose objects in the vicinity of turnouts, particularly where trainmen or others are required to walk. When filled or covered with snow, depressions may become a source of personal injury. Special attention should be directed toward obtaining proper drainage, particularly around the frogs and switch points to avoid the formation of ice during freezing and thawing weather.

After this work is completed, it is well to make a follow-up inspection to insure that nothing has been neglected. Proper preparation not only reduces winter switch maintenance, but also shortens the time that is required to make the switch inspection. When inspecting switches in winter, it should be noted particularly whether guard-rail clamps are tight, since the snow which is packed in the flangway by passing wheels will tend to crowd under the base and lift the guard rail. All parts of the turnout requiring bolts should be kept fully bolted, the bolts tight and keyed in place. It is especially important in the winter to note the condition of the angle bars at frogs and at the heels of switches. Joint fastenings at these points seem to be more susceptible to breakage during cold weather than at other seasons.

Finally, a close inspection should be made to determine whether the moving parts of the turnout have been kept free of snow and ice. This includes points bridle rods, connecting rods and spring rails. Only a small amount of snow or ice under a spring rail will cause it to break. Similarly only a small amount packed in the flangway will keep switch points and spring rails from closing properly.

Inspection Should Be Frequent

By ROBERT WHITE
Section Foreman, Grand Trunk Western, Drayton Plains, Mich.

In my experience, I have found no basic difference in the method of inspecting switches in winter from that which should be employed at other seasons. All of the items that should be noted at other seasons should be noted as carefully in the winter, except excessive expansion which results from high temperature. There are certain precautions which are necessary in the winter, however, which are not required at other seasons and certain conditions that must be kept in mind, which do not obtain in warm weather.

Two of these precautions stand out more prominently than others, which are so obvious that they need only to be mentioned, such as drainage; smoothing of the ground; filling holes and removing loose objects which may be hidden by snow; the necessity of having all moving parts without lost motion, but adjusted to work easily; making certain that guard-rail clamps are tight; and the removal of ballast for some depth below all moving parts.

During the winter, switches should be inspected daily by the foreman, who should never delegate this work to the men who clean them. When making this inspection, he should satisfy himself that no packed or frozen snow has been left in the points to prevent a snug fit against the main or stock rail. It is harder to keep a switch in proper adjustment during cold stormy weather and the adjustment should be given close attention. Otherwise, trainmen who are throwing it for a trailing movement will often throw it part way over and depend on the thrust of the wheels to complete the movement. The danger from this practice does not require comment.

It is also important that switch locks be inspected carefully at this season. During sleet storms or when wet snow is falling, the spring cover which protects the keyhole does not always work freely and the sleet or snow may get inside, making it impracticable to open the switch without thawing the lock. A lock that has no protection should be replaced.

Winter Switch Inspection Is Important

By H. BECKER
Section Foreman, St. Louis-San Francisco, Rush Tower, Mo.

Switch inspection is one of the important duties of a foreman during the winter and one which should never be neglected or performed in a perfunctory manner. Ballast should be kept well away from all moving parts, partly to prevent fouling as a result of heaving and partly to form a pocket for the temporary storage of snow until it can be cleaned away. Greater care in making the inspection is also necessary, because many defects are not to easily detected at this time.

Every foreman of experience knows that certain items of preparatory work should be done before the ground freezes. If these have been cared for properly, the work of making the inspection will be considerably lightened

and the cost of winter maintenance will also be reduced. So far as my experience goes, there is no great difference in the method of winter inspection, as compared with the summer. The inspection must be in greater detail, however, and should be made at least once a day. Obstructions which might affect the closing of the points or the spring rail on frogs may occur at any season, but snow and ice are added to the list during the winter. The guard rail requires more careful and more frequent attention at this season, particularly during or immediately after storms. Other than the complications introduced by snow and ice, however, the other items that require attention are the same as at other seasons. Three things should be borne in mind by every person whose duties require him to make switch inspections: Drainage is all important; breakage of joint fastenings occurs more frequently; and switches get out of adjustment more quickly in cold weather than when it is warm.

--x--

Lining in Winter

Where tie plates are attached to the tie independent of the rail, what methods can be employed to line track during the winter when the roadbed is frozen ?

This Is a New Situation

By E. E. BOYER

Retired Roadmaster, Missouri Pacific, De Soto, Mo.

The use of tie plates that are fastened to the tie independent of the fastenings which hold the rail in place is so recent that I doubt whether any established practice along this line has been developed. It was my fortune to have charge of the installation of more than four miles of GEO. track in 1930, which has an independent fastening between the tie plate and tie. So far, the situation suggested in the question has not arisen in this installation. As this is the only installation of independently held tie plates that I have seen, I can only draw on my experience in other cases in giving an answer to the question.

If it is necessary to line the track when the roadbed is frozen, I would remove the lag screws, loosen the clip bolts which hold the rail in position and slip the tie plate into the adjacent space between ties, completing this as far as the track requires lining. The next move would be to plug the lag-screw holes and adze the plugs level with the surface of the tie. The tie plate should then be replaced, shifting it enough to avoid using the original lag-screw hole in the tie. Finally, shove the rail into line and spike or bolt, as preferred, using two spikes or bolts to the plate instead of four. This would be sufficient to hold it and would reduce the mutilation of the ties to a minimum. The rail seats and fixtures should be replaced in their original positions at the earliest opportunity.

Presents No Fundamental Difficulty

By Engineer Maintenance of Way

It is only recently that the practice of fastening tie plates to the ties by means of a fastening that is independent of the rail fastening has been followed in this country, but already new problems have arisen, among them the one covered by the question. While this particular problem is not of widespread importance at present, as the practice of applying tie plates in this manner is extended it will become of more importance.

It is an axiom that the best time to do winter track work is before winter sets in. It is obvious that any lining that is necessary at this time should be done before the roadbed is frozen to eliminate the necessity of later spike lining. Even with the best of preparation, however, spike lining becomes necessary at times, and the new method of applying tie plates adds some complications to a none too-desirable job.

When the rail is shifted laterally, it is necessary to shift the tie plate also. To do this, the lag screws must be removed and the holes plugged. If practicable, it is better also to shift the tie plate longitudinally with the track to avoid returning the screws approximately into the same holes. Otherwise their holding power may be decreased or the tie will be more seriously damaged.

After the rail is lined, it should be tacked in position on alternate ties by means of cut spikes and fastened permanently on the remaining ties by means of the tie plates and lag screws. Finally the cut spikes should be withdrawn and the alternate plates secured permanently in the same manner.

--x--

Dead-Air Space

What are the advantages, if any, from the view point of insulation, of a dead-air space in the exterior walls of buildings ?

Theoretically Ideal, Practically Valueless

By Heating Engineer

Still air through which there is no radiation provides the ideal form of insulation and is the basis used in measuring the relative value of different forms of insulating materials. On the other hand, while air is an extremely poor conductor of heat, it offers little, if any, obstruction to radiation. It is this latter property which is largely responsible for the fact that the air space in walls of buildings has such low insulating value.

Many building and heating engineers attribute the low insulating value of air spaces in walls to convection and the practical impossibility of maintaining absolute dead air or of eliminating air leakage from this space. In the ordinary building, however, about 50 per cent of the heat that is lost through the walls passes across the air space as radiation. Conduction is always present, but the heat losses are more particularly increased by convection, the magnitude of this form of heat transfer being roughly proportional to the difference in the exterior and interior temperatures.

For these reasons, the insulating value of an air space is not proportional to its width, as is true of solids. Tests have shown that the insulating value of dead air without radiation remains practically constant for all spaces greater than ¾ in. Below widths of ½ in., the insulating value is about proportional to the width. The thermal conductivity of dry air is about 0.18 B. t. u. per hr. per sq. ft. Every known solid has a greater thermal conductivity than air. The conductivities of most of the insulating materials on the market range from 0.25 to 0.35 B. t. u. per hr. per sq. ft. for a temperature gradient of 1 deg. F. per inch of thickness.

Although, from a theoretical view point, dead dry air provides an ideal insulation, the practical difficulties of providing the conditions which will eliminate radiation, convection and leakage are so great that the dead air spaces in building walls may be said to have no insulating

value whatever. I am aware that this is contrary to general belief, but the truth of this statement has been proved by numerous tests. It is a fallacy, therefore, to put reliance in this form of construction, and the proper method of insulating a structure is to apply cellular or fibrous materials which have definite and known insulating properties.

Impracticable to Maintain a Dead-Air Space

By A. T. HAWK

Engineer of Buildings, Chicago, Rock Island & Pacific, Chicago

We used to think that dead-air space in the exterior walls of buildings was the solution of the problem of excluding cold in the winter and heat in the summer. Theoretically, a dead-air space would do this effectively. From a practical standpoint, however, it is extremely difficullt to construct or maintain indefinitely an absolutely dead-air space. In fact this demands that the air space be broken up into relatively small units and sealed.

Formerly we built the exterior walls of our ice houses with a double thickness of sheathing on the inside and outside of the studding, placing building paper or other insulating paper between each of the two layers of sheathing. We also took other precautions, such as cementing all joints and laps in the building paper to insure a dead-air space in the walls. We found, however, that these walls did not compare favorably with similar walls which were filled with dry sawdust, and have since used the latter method of insulation.

Dry sawdust makes a fairly satisfactory and economical insulation for ice houses, but it must be kept dry. It does not compare with cork insulation, but is much cheaper. Hollow tile, or bricks that have small cavities to form small individual hollow spaces, make fairly well insulated walls. Owing to the fact that expansion, contraction and settlement tend to open up small seams, the dead-air feature is not often possible of accomplishment in such walls.

In recent years, marked advances have been made in the development of various types of building insulation and a number of products of considerable merit are available for all types of building construction, most of which can be obtained at relatively low cost. In my opinion, dead-air spaces provide an ideal method of insulation, provided they are maintained indefinitely. The only way that this can be done is by using a type of insulation that contains minute dead-air spaces that will not be affected by expansion, contraction or settlement. Several such materials are now on the market.

Is Effective Against Heat and Sound

By J. W. ORROCK

Engineer of Buildings, Canadian Pacific, Montreal, Que.

Generally speaking, the insulating value of any material varies directly with the percentage of confined air cells or dead-air spaces, in other words, with the number of units of its structure in which air circulation is impossible.

It has been found by test that convection currents are set up in insulating materials that contain large dead-air space units, resulting in higher thermal conductivity. Similarly it has been found that materials containing small or minute dead-air spaces provide more effective insulation, and that the desired degree of insulation can be obtained by varying the thickness of the insulating material.

For the average fireproof building, the use of clay tile or other forms of cellular building blocks is advantageous, particularly since they have other important properties. These materials, in addition to their insulating value, serve to furr out or form exact lines for the interior finish of rooms. At the same time, they provide surfaces to which plaster or other wall finishes can be applied.

More recently, the value of dead-air spaces for insulating against sound is beginning to be appreciated. The same properties in materials which provide insulation against heat transference tend to minimize the transmission of sound.

Climatic conditions have considerable influence on the effectiveness of insulating materials. Insulation is required primarily to prevent rapid changes in temperature which result in the condensation of moisture on interior wall surfaces, the thickness and type of insulation to be selected being governed largely by this requirement. Generally speaking, hollow clay tile or other cellular materials, 3 in., 4 in. or 6 in. thick provide ample insulating protection against ordinary climatic conditions to eliminate condensation on the interior surfaces of brick, concrete or stone walls.

Keeping Spikes Down

Is there any advantage in keeping the spikes driven down to a snug fit against the flange of the rail? If so, how can this be accomplished ?

They Should Not Be Snug

By C. W. BALDRIDGE

Assistant Engineer, Atchison, Topeka & Santa Fe, Chicago

In his excellent paper on The Mechanical Wear of Ties, which he read before the A. R. E. A. in March, 1928, Dr. Herman von Schrenk presented ample proof that in the wearing of the rail or tie plate into the tie, it is the relative movement between the two which causes the cutting. In addition to Dr. von Schrenk's investigation, this fact has been demonstrated frequently in practice. It has also been demonstrated that if the rail and ties are held together rigidly, so that there is no relative movement between them, the ties will move with every movement of the rail, and again it is the movement which cuts. In this case, however, the tie is cutting its way through the ballast, with a consequent derangement of the surface of the track.

The best track practice is, therefore, to leave sufficient room between the base of the rail and the underside of the head of the spike, clip or whatever form of rail fastening is used, to permit the wave motion of the rail to take place without exerting any lifting action on the ties.

These studies and experience, as well as track tests, have shown that there is no advantage, but on the contrary a positive disadvantage, in requiring that track spikes fit snugly against the top of the base of rail.

There Is No Advantage

By Engineer Maintenance of Way

It is assumed that the question refers only to the contact between the under side of the head of the spike and the rail base. The chief function of the spike is to maintain gage, and this depends entirely upon a close and rigid contact between its shank and the edge of the rail base. This is not, therefore, a subject of debate.

The spike head is useful principally to facilitate the

driving and pulling of the spike and to lift the ties when the track is raised for any reason. The heads of the inside spikes may also prevent the turning of the rail on heavy curves. Surface irregularities, uneven tie tamping and the wave action of the rail make it impracticable to hold the tie and the rail together rigidly, and the spikes should not be relied on to do this.

Except, possibly, immediately in advance of surfacing, spikes should not be tapped down to secure contact between the head of the spike and the base of the rail, and no attempt should be made to maintain them in this position. Wave action will soon lift the spike slightly. If the policy is pursued of continually settling the spikes, a repeated sequence of pulling and redriving is established, which shortly weakens the holding power of the spikes, damages the wood fibres surrounding the hole, facilitates the entrance of water around the spikes and results in rapid decay. In addition, there is always danger of injuring the base of the rail or the heads of the spikes by blows after contact is made. A slight clearance allows free wave action without pumping the ties in the ballast, while it affords a better grip for the claw bar when the spike is pulled.

Should Be Kept Snug

By W. H. SPARKS
General Inspector of Track, Chesapeake & Ohio, Russell, Ky.

It is my observation that the section foremen who maintain the best line and surface are invariably those who insist on keeping their spikes driven down to a snug fit. To my mind this is not a coincidence, and there are several reasons for taking the affirmative side of this much-debated question.

When surfacing track, ties that are loose from the rail tend to produce uneven tamping and thus result in uneven settlement. It is difficult, if not impracticable, to do a finished job of lining on rail that is loose in the spikes, no matter how tight the shanks of the spikes may be against the base of the rail. Snug-fitting spikes retard rail creepage, both with and without anti-creepers. Where the rail shows a tendency to cant, snug-fitting spikes aid in keeping it vertical. Not the least important reason for advocating the maintenance of a snug fit is the fact that it prolongs the life of the ties by reducing the attrition of the wood fibres through preventing movement between the ties and the rail or tie plates.

Finds a Decided Advantage in Doing So

By E. E. BOYER
Retired Roadmaster, Missouri Pacific, De Soto, Mo.

I consider that there is a decided advantage in keeping the spikes driven down to a snug fit on the flange of the rail. Doing this eliminates movement between the tie and the rail or tie plate and this in turn eliminates or greatly reduces the mechanical wear on the tie, the effect being more pronounced where tie plates are not used. It also reduces the neck cutting of the spikes, thus reacting favorably on the line. It also makes the track more nearly noiseless during the passage of a train and, all in all, is an important factor in the maintenance of smooth-riding track.

The lifting of the spike heads is caused largely by uneven surface. A low joint sinking under the passing wheels causes the center to rise, thus lifting the spikes. Freezing and thawing often cause the spikes to start from the tie. It may never be possible to keep cut spikes always snug against the flange of the rail, yet by maintaining the track to uniform line and surface, the tendency to lift will be minimized. The best time to drive spikes down is when the ties are wet. As the wood dries out, the fibres stiffen and set against the spike, giving it a greater holding power than if the driving is done against dry wood.

Impracticable to Keep Spikes to a Snug Fit

By CHARLES E. SANDOVAL
Section Foreman, Southern Pacific, Tubac, Ariz.

It is a difficult if not impossible task to keep spikes driven down to a snug fit against the top surface of the rail base. The wave motion of the rail under traffic tends to lift the spikes ⅛ in. to ¼ in. This tendency is roughly proportional to the number and length of the trains passing over the district, while the kind of wood from which the ties are made also has a noticeable influence.

After a lift not exceeding ¼ in., the spike has lost little of its grip in the tie. If it is driven down, however, its holding power is greatly reduced and it will lift again in a much shorter time and usually to a greater height. Where the lift is more than that required to accommodate the wave motion, the spike should be pulled and redriven after the hole is plugged. In my opinion, when driving or redriving spikes, allowance should be made for the wave motion of the rail, and the driving should stop short by this much of making a snug fit.

Good Spiking Prolongs the Life of the Ties

By H. BECKER
Section Foreman, St. Louis-San Francisco, Rush Tower, Mo.

On the grounds of the saving that can be made in the service life of the ties, snug-fitting spikes can be amply justified. There are other convincing arguments, however, which can be used in favor of this practice. Where spikes are permitted to get loose, the mechanical wear which takes place under the rail or tie plate is intensified to the extent that the life of the tie is definitely shortened. Often, the cutting, as this form of wear is usually designated, progresses to the point where the ends of the ties break off, even with careful tamping.

When surfacing track that has lifted spikes, it is always more economical to tap the spikes down ahead of the raise than it is to assign one or more men to the work of nipping the ties for the tampers. Furthermore, a much smoother and more uniform job of tamping is always obtained, while the tamping requires less time.

In addition, the resistance to creeping offered by snug-fitting spikes, the reduction in the number of throat-cut and broken spikes, the greater ease with which track can be lined and the better quality of the line are among the favorable results which are obtained from snugly fitting spikes.

Good Spiking Is Essential

By T. E. QUINN
Assistant Engineer, Wabash, Decatur, Ill.

Good spiking is an essential element in the maintenance of first-class track. If spikes do not fit snugly against the edge of the base of the rail, an appreciable amount of lateral movement results, which directly affects both line and gage. If the rail is not clamped firmly and rigidly to the tie, the vertical movement of the rail wears the under side of the head at its junction with the shank, resulting in a throat-cut spike, the head of which may shear off or break off under a hammer blow.

Where an appreciable number of spikes are allowed to lift, the stresses set up by passing trains are frequently sufficient to shear the heads of the remainder which have not lifted. On the semi-yielding type of roadbed which

is universal in this country, passing trains set up a wave motion in the rail which tends to lift the spikes. When they have been raised to such an extent as to eliminate all pressure on the rail, the wave motion causes the rail to creep through the spikes without resistance.

It is evident that there are definite advantages in keeping the spikes driven down to a snug fit on the flange of the rail. This can be accomplished only with difficulty, however, unless the original spiking was done correctly. Spikes should be started vertically and driven straight. The resistance which they offer to both horizontal and vertical pressures is always greater than when they are driven on a slant or are bent when partly driven. No spiker should ever be allowed to start a spike on a slant or bend it toward the rail during the process of driving. Spikes so driven always lift more quickly and are also more inclined to move horizontally.

Excavating Frozen Ground

What means, if any, can be employed to make foundation excavation in frozen ground ?

Adapt Method to Conditions

By Assistant Engineer of Maintenance

In selecting a method for excavating foundations in frozen ground, one must be chosen which is or can be adapted for the conditions which surround the job. The size of the excavation, the depth of the frost and the location of the work are factors which must be given consideration. If it is in a district where explosives cannot be used safely, mechanically-operated spades or drills can often be used to advantage for breaking up the soil. If the frost is not deep, hand picks, reinforced by sledges and drills, may be sufficient. Out in the open, where there is no objection to the use of explosives and where flying material can do no damage, blasting may be resorted to with good results.

After an opening has been made by any of these methods, the application of a steam jet, by means of which live steam is forced well under and into the frost, is often very effective. Heat applied by bonfires or other methods to the surface of large areas is seldom effective. If the frost is not deep, however, excellent results are sometimes obtained over small areas. Placing dry unslacked lime over a frozen area and applying water to it has had a good effect in some instances.

No hard and fast rule can be laid down for work of this kind. Each job must be worked out accordingly to the conditions which surround it. The methods which have been mentioned, either singly or in combination, have been effective, however, over a wide range of work.

Frost Offers Few Obstacles

By E. C. NEVILLE

Bridge and Building Master, Canadian National, Toronto, Ont.

Since the programming of maintenance work has become common practice on a great number of roads, careful study has been and is being given to determine what work can be done during the winter with the same economy as during warm weather. In most instances, foundation excavation falls in the class which can be done efficiently during cold weather.

As a matter of fact, foundation excavation can often be done more economically in the winter than in the summer. The reason for this is that the frozen ground often eliminates the necessity for expensive sheeting, shoring and bracing, and sometimes pumping, so that the saving on these items more than offsets the extra cost of penetrating the frost. Normally, the only added expense is that for breaking through the frozen crust, and this can be reduced or eliminated if proper preparation is made late in the fall. This can be done by covering the site of the work to a liberal depth with stable manure or leaves which will retard or, perhaps, prevent frost penetration.

Where no protection has been provided and the ground has frozen to a considerable depth, it is often helpful as well as economical to build a fire of discarded track ties, with sufficient body to burn all night. Usually this will draw all of the frost so that the excavation can be made without resorting to the use of wedges, sledges or steel points. Under some circumstances it is more convenient to break the frost with a pile driver than to use a fire.

No matter what method is used, foundation excavation can be accomplished with equal economy in winter as in summer. There is the additional advantage that it leaves the summer months free for the performance of work that cannot easily be done during the winter.

Winter Tank Operation

What can be done to insure the uninterrupted operation of infrequently-used water stations, where the formation of ice in the tanks, spouts, cranes, etc. is unavoidable ?

To Avoid Failures Is of First Importance

By E. M. GRIME

Engineer of Water Service, Northern Pacific, St. Paul, Minn.

Before making any plans, a thorough investigation should be made to ascertain whether the formation of ice is actually unavoidable and not largely the result of improper operation or neglected maintenance. One of the most important details of wayside tank maintenance is to keep the outlet valve which serves the spout in perfect operating condition.

These valves are usually of the flap type and are provided with a rubber seat to insure a water-tight joint. This seat must be renewed before it becomes hard, cracked or worn in such a manner as to prevent an even bearing at all points and thus allow a slight amount of leakage. The hinges on the flap and on the guide should be in good condition; not sufficiently loose or worn to permit the flap to seat out of correct position. When a tank is built or repaired, care should be exercised to insure that the carpenters do not leave chips or other small pieces of wood or other material which may wash onto the seat and prevent the tight closing of the valve.

Even though ice forms to a thickness of as much as three feet on the inside of the tank staves, this need not interfere with good operation if the outlet valve is located at about the center of the tank and 18 in. above the floor, where it will be above the ice that tends to form across the floor. The formation of thick ice at the upper water line can be largely avoided by providing an adequately insulated roof. It is desirable to keep the tank moderately well filled at all times to avoid the possibility of floating ice interfering with the valve operation.

Most of the trouble which results from tank spouts filling with ice is caused by a slight leakage at the valve. The outlet pipe should have a slight slope, say about 5 deg., toward the spout, to insure that the water will pass out rapidly. At outlying points where water is taken in-

frequently, it may be necessary to maintain a refrigerator-car heater or barn lantern to prevent the freezing of the tank riser pipes. In some cases it has been found desirable to house in all of the bottom of the tank and place a heating stove inside, with the pipe passing up through the water and above the tank roof.

Water columns must be so installed that the valve is below the frost line. Otherwise it becomes necessary to protect the pit with some form of insulation. Most columns of modern design drain freely every time they are operated, so that there is no opportunity for them to freeze. If they are of an older type, it may be necessary to give careful attention to packing to hold the water below the frost line when the column is not in use.

To avoid failures, careful handling of locomotive-watering facilities is of first importance, especially during the winter. The water-column spout should not be removed from the tender until the valve has been closed and the flow of water ceases. Likewise, the spout on a water tank should not be thrown back into normal position until the flow has stopped. If the tank valve does not seat properly the first time it is closed, the fireman can usually remedy the trouble by opening and closing it a second time.

If these details have not been taken care of, or if for some other reason ice does accumulate in the outlet pipe and spout, the best remedy is to provide steam connections on the local freight engines so that the facilities can be thawed out when necessary.

Heat Is Most Reliable Remedy

By E. C. NEVILLE

Bridge and Building Master, Canadian National, Toronto, Ont.

Since an uninterrupted supply of water is vital to a railway, it becomes of first importance to know that proper preparation for low temperatures has been made in latitudes of severe winters. In the fall the water service forces should go over all tanks and water delivering equipment, making certain that all valves are seating properly, that all packing is in good condition, that all frost boxes are weather tight, and that there are no incipient leaks or other conditions which will give trouble later.

At infrequently-used water stations, a coal stove, of sufficient size to hold the fire over night, should be placed in the frost box which protects the riser pipes under the tank. Such tanks should be equipped with a wrought-iron pipe to run up through the water and above the roof. This should have a flanged connection with the floor of the tank to insure against leakage and danger of fire. The stove pipe can then be inserted and the pipe will act as a chimney which will transmit enough heat to the water to retard freezing. The fire should be attended to by the section forces or a track walker regularly, so that it will be kept going continuously. Car heaters of either the oil or charcoal type should not be depended on in districts where the winters are severe.

A section of steam hose with proper connections should be kept on hand so that it can be attached to a locomotive and used for thawing outlet pipes and other parts of the tank or water column equipment.

How One Road Controls Drifting Sand

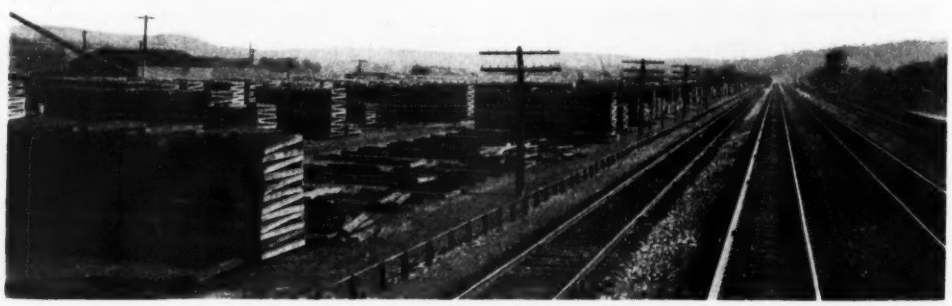
(Continued from page 29)

The net result of the effort made on this road to cope with the sand problem has been either marked improvement in former conditions or complete control of the sand. At the present time, difficulty in holding the sand is experienced in only about 4 miles of the 46 miles of blow sand territory, and even in this limited territory, conditions are greatly improved over what they were prior to the oiling and the installation of the sand fences. This is evidenced by the fact that last year it cost only about $200 to remove what little sand accumulated on the track in this territory. One of the principal reasons for the difficulty in controlling the sand completely in certain sections is the inability to oil out beyond the limits of the right-of-way, because of irrigated and cultivated land.

A striking example of how serious the drifting sand problem is normally in this particular territory if not controlled is shown in the case of a 1½-mile spur track. This spur, which is used solely for bringing out fruit during the fruit season, is so subject to the drifting sand that no attempt is made to protect it or to keep it open, except during this period. For the same reason, it is not possible to maintain a permanent loading platform at the end of the line, since experience has shown that it would be completely buried in sand and require digging out each year for loading purposes.

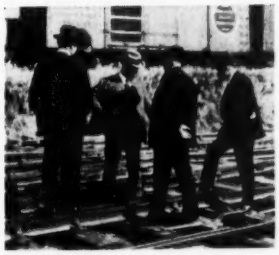
In view of this latter fact, the platform is built up in about 20 sections, each 20 ft. long and 4 ft. wide, which are moved in and out each year on a train of flat cars, with a force of about 14 men.

As it is not possible to protect the track adequately from the sand on account of the fruit groves along both side, where oiling cannot be done, attempt is made only to keep the track open during the summer for the movement of the fruit. Thus, late in June or early in July of each year a force of men is required to dig out the track and make it passable. Last year it required an extra gang of about 30 men working for 7 days to clean the track. This work was done largely with hand shovels, loading the sand onto flat cars for disposal along high fills on the main line.



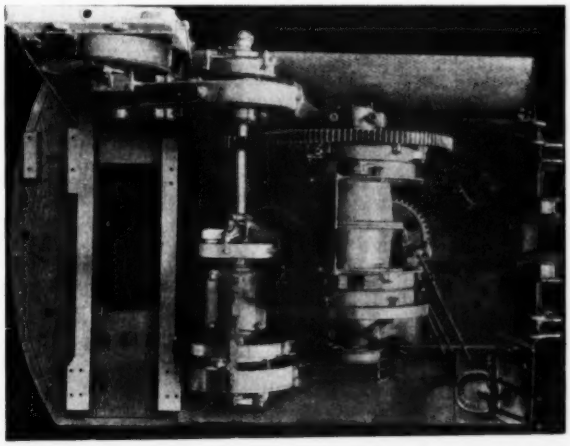
Baltimore & Ohio Treating Plant Yard at Green Spring, W. Va.

NEW *and* IMPROVED DEVICES



Bucyrus-Erie Develops Small Combination Machine

THE Bucyrus-Company, South Milwaukee, Wis., has added a new unit to its line of convertible shovel-dragline-crane-clamshell machines that is adapted especially to railroad maintenance work. This machine, which is known as the 21-B, is similar in general construction to the 43-B, 37-B and 32-B units, but is smaller, more conveniently handled in close quarters and more readily transported from one job to another. Its size may best be judged by the fact that it is designed for the use of a ¾-yd. shovel and its working weight ranges from 45,000 lb. to 53,400 lb., depending on the character of



The Machinery Arrangement is Compact—Engine Removed in This View

work for which it is fitted up. The 21-B, like the other machines of the same type, is equipped with tractor treads and is furnished with a gasoline, Diesel or electric power unit as desired.

The shovel may be had with either rope or chain crowd, and with boom and dipper-stick combination, giving a maximum dumping height up to 21 ft. 3 in. with the boom at 60 deg., and a maximum radius at this maximum dumping height of 19 ft. The maximum dumping radius may be as great as 25 ft. 6 in. with a 20-ft. boom, 16-ft. sticks and a ⅝-yd. dipper, or 24 ft. 3 in. with an 18-ft. 6-in. boom, 14-ft. dipper handles and a ¾-yd. dipper. The cutting radii for the same two combinations with the boom at 45 deg. with the horizontal, are 28 ft. 3 in. and 27 ft. 3 in. respectively. The rear and clearance of the machine is only 8 ft. 6 in.

The several caterpillar mountings that are available for the machine have overall widths of 8 ft. 11 in. or 9 ft. 2 in. and overall lengths of 10 ft. 8¼ in. to 11 ft. 11½ in. The treads are either 19 in. or 22 in. in width. As a dragline or clamshell the machine is supplied with either a 35-ft. or a 45-ft. boom, the stability being such that a wide range of action for a machine of this size is enjoyed. It is rated at 10 tons for a 12-ft. radius. The cab is of the all-weather type like that furnished with the other machines.

Two Concrete Vibrators

THE Syntron Company, Pittsburgh, Pa., has developed and is now marketing two new portable electric vibrating hammers for vibrating concrete in the forms. The two models, which are differentiated mainly by their sizes and, therefore, their vibrating capacities, are known as Models No. 11-60 and No. 16-60. The design of these hammers is simple, consisting of two electro magnets reciprocating a freely moving piston which strikes the vibrating tool directly on the shank, as is the case with

Vibrating Reinforcing Rods With Two of the Vibrators

other Syntron percussion tools. Each vibrator imparts 3,600 vibrations per minute either to the form or directly to the reinforcing bars as desired.

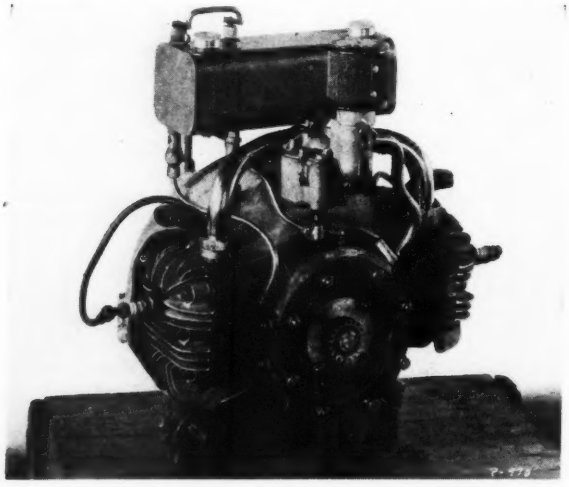
Model No. 11-60, which is the smallest and lightest of the vibrators, weighs 11 lb. and is designed particularly for vibrating forms made of light planking, using a tool with a mushroom-shaped head for contact with the formwork. This tool is held against the form by the operator, who moves it about to follow the flow of concrete. It can be used also for vibrating the lighter reinforcing bars, as shown in the accompanying illustration. On the other hand, Model No. 16-60, which weighs 16 lb., is

designed for vibrating larger sizes of reinforcing bars and forms made of heavy planking. These hammers are designed to be operated by 110-volt, 60-cycle, alternating current supplied from a lighting circuit or a portable generator. It is said that they may be operated continuously all day by one man without undue fatigue.

New Gasoline Engine for Wolf Saw

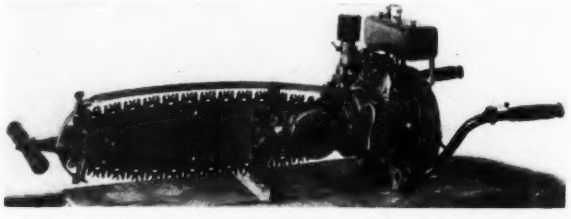
THE Reed-Prentice Corporation, Worcester, Mass., has developed a new two-cylinder, four-cycle, air-cooled gasoline engine, which, while designed particularly for use with this company's Wolf portable timber sawing machine, is said also to have other applications in the industrial field, such as the operating of pumps, construction machinery, motor cars and light and power plants.

The new engine is of the opposed two-cylinder type, weighs 46 lb. and develops 8 hp. at 3,600 r.p.m. The cylinders, which are made of nickel cast iron, have a bore of 2.5 in. and a stroke of 2,125 in. Other mechanical features of the engine include Champion spark plugs, cylinder heads of heat-resisting aluminum alloy and pistons of the same material, a Bosch flywheel-type magneto, a Tillotsen carburetor, poppet type valves, and ball bearings supporting the crankshaft and camshaft.



The New Reed-Prentice Gasoline Engine

The flywheel is 11 in. in diameter and is cast in the form of a fan which supplies a blast of air around the cylinders and cylinder heads by means of a housing of magnesium metal. The connecting rods and crankshaft are drop forged and machined all over and the connecting-rod bearings are of the roller type. All pin bearings are made of nitroloy, while the crank case and other general castings are of a magnesium alloy. Oil for lubrication is supplied from the oil tank to one cylinder and thence to the opposite cylinder by splash. The engine is started by means of a cord in the same manner as an outboard motor.



The Wolf Portable Gasoline-Powered Sawing Machine

When equipped with the new gasoline engine, the Wolf portable timber saw, which is available in 16-in. and 24-in. capacities, weighs 70 and 73 lb., respectively.

New Ballast Cleaner Operated on the Lehigh Valley

DURING the last summer a new type of ballast-cleaning machine was operated on the Lehigh Valley, where it cleaned 200 miles of inter-track ballast, working one shift a day for 135 days, between April 17 and October 24. This new machine, which is mounted on a special flat car and is designed to be pulled over the track by a steam or gas-electric locomotive or other suitable power unit, consists essentially of a twin arrangement of scoops, belt conveyors, vibrating screens, ballast chutes and scrapers, one on each side of the car, and a single pivoted boom conveyor for the discharge of the dirt screened from the ballast.

The two screening arrangements operate independently of each other, and are provided so that the machine can clean the ballast on either side of the track, or on both sides simultaneously, if desired. The scoop, when in its lowered position, picks up a swath of ballast 27 in. wide and of uniform depth, which is deposited on a short elevating belt conveyor, 24 in. wide, fixed rigidly within the scoop, which, in turn, conveys the ballast to a longer elevating belt conveyor. This latter conveyor, which is also 24 in. wide, is inclined inward toward the center of the car at the rear and is known as the screen conveyor. It carries the dirty ballast to the top of an inclined screen, which, when in operation, vibrates at the rate of 1,800 vibrations per minute. From the screen, the cleaned ballast passes into a hopper with discharge chutes, from which it can be delivered either to the inter-track space or between the rails.

The dirt screened from the ballast falls into a large open-bottom hopper, which serves both screens of the ballast-cleaning arrangement. The dirt conveyor consists of an 18-in. belt mounted on a horizontal boom, 23 ft. in length, pivoted at its inner end directly under the discharge opening of the dirt hopper, so that it can be swung to either side of the car or directly to the rear. Thus, the dirt can be carried off in any direction desired and be discharged at any point within reach of the boom. Through this same mounting of the dirt conveyor boom, it can be brought quickly within the clearance limits of the car.

The size and arrangement of the scoops on each side of the car are such that the machine can be continued in operation while trains are passing on an adjacent track, if the track centers are 12 ft. 8 in. or more, and that the scoops can be pulled up quickly, bringing them entirely within the side limits of the car when it is desired to clear or to move the machine over the road out of service. Another feature of the scoop is a safety device which insures against damage to the scoop or other parts of the equipment in the event that it encounters an obstruction. When an undue strain is put upon the scoop, the safety device goes into action and causes an emergency application of the brakes on the ballast-cleaning train.

Vertical adjustment of the scoops is possible since they are hung in heavy guides on the sides of the car and are operated by power screws. This arrangement permits the lowering of the scoops vertically to a maxi-

mum depth of 29 in. below the top of rail, and is such that the depth at which the scoops are operated can be changed at will while the machine is in motion.

Retiring of the scoops entirely in the clear to permit road movement of the machine out of service is done, in each case, by means of a cable, and heavy steel arms which are connected rigidly to the scoop guides at one end and are pivoted directly over the center sill of the car at the other end. The hauling in on the cable rotates

The New Machine in Operation on the Lehigh Valley, Pulled by a Gasoline-Electric Locomotive

the scoop upward and inward through an arc about a shaft over the center sill, until the scoop rests in a horizontal position over the car platform, where it is locked in place.

The screen conveyor can also be brought entirely within the side limits of the car. This is made possible by a pivoted connection at the top of the conveyor and a cut-away section in the car platform, whereby the lower end of the conveyor can be swung inward from its operating position to a locked position within the clearance limits.

Owing to the irregularity of the lines of the ends of the ties in the inter-track space, the scoop operates sufficiently far from the rail to clear the longest ties. This

The Machine from the Rear, Showing the Screening Operations

leaves a fringe of uncleaned ballast along the ends of the ties, which is removed by the scraper mentioned previously.

The scraper is a suitably shaped blade installed between the scoop and the point of return of the cleaned ballast, and is supported in vertical guides in which it can be raised and lowered by a power screw. The front edge of the blade is made to hug the ends of the ties by means of a spring arrangement but is provided with a curved nose which carries it smoothly out over the ends of the longer ties.

All of the moving parts of the new ballast cleaner are operated by a 30-hp. gasoline engine, and all control of operations is centered in a cab at the forward end. As the machine operates automatically after it is started, the force employed with it consists of only three men; a foreman, an operator and a laborer, in addition to the train crew.

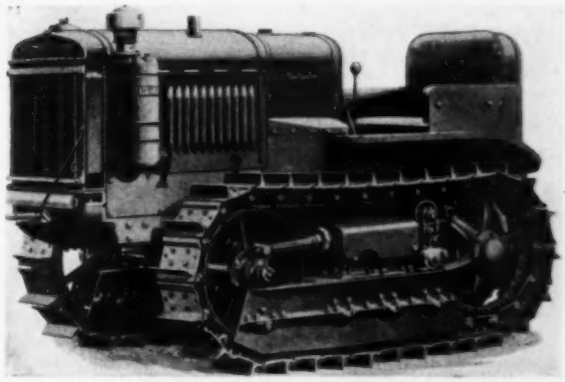
With proper regulation of the speed of the train, slowing down where the ballast is particularly dirty or wet, it is necessary to make only three passes over the inter-track space to clean the ballast thoroughly. In the first pass the scoop picks up the ballast in slightly more than half of the space, and the scraper, following behind, pushes the ballast left along the tie ends out into a ridge in the center of the inter-track space. The next pass is made from the adjoining track, where the remainder of the unclean stone, except that immediately along the ends of the ties of the track on which the machine is operating, is picked up and cleaned. The remaining dirty stone along the tie ends is then pushed out into the center of the inter-track space by the scraper and is picked up and cleaned in the third pass of the machine, which can be made from either track.

Pulled by a gasoline-electric locomotive, the machine is operated at a speed of about one mile an hour. Working one shift a day for 135 days, and clearing for traffic, the machine cleaned 200 miles of inter-track space on the Lehigh Valley during the last summer, operating only one of its sides at a time. The machine, which was developed by Frank Speno and tested on the Delaware, Lackawanna & Western last year, was operated on the Lehigh Valley under contract by the Frank Speno Railroad Ballast Cleaning Company, Inc., Ithaca, N. Y.

New McCormick-Deering Tractor

THE International Harvester Company, Chicago, has added a crawler tractor, known as the Model T-20 Tractractor, to its line of McCormick-Deering power equipment, which is designed particularly for the operation of bulldozers, back-fillers, shovels, snowplows, crawler wagons, scrapers and graders. This tractor is 112 in. long and turns within a circle having a radius of 6 ft. It has three speeds forward of 1¾, 2¾ and 3¾ miles per hour, respectively, while in reverse the speed is 2 miles per hour. The tread width is 41½ in., the length of ground contact is 52½ in., the overall width is 55 in., and the height of the radiator is 55 in.

The new tractor is compactly designed and is easily operated, all controls being within ready reach of the operator. In the design, care was taken to protect its working parts against the entrance of dust. The bearings of the drive gear and pinion shaft are provided with



The McCormick-Deering Model T-20 Tractractor

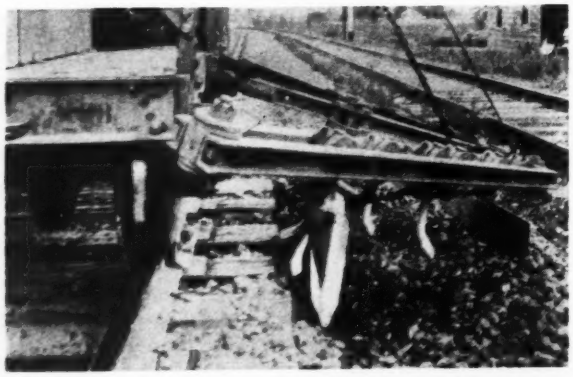
diaphragm-type oil seals of new design. Forty ball bearings, seven of which are located in the engine, are provided, the transmission and final drive parts being mounted entirely on these bearings. The tractor is of the "triple-power" type, in that power is provided at the belt and drawbar as well as through a power take-off for the operation of auxiliary equipment.

Large single-plate steering clutches, which are said to be a new feature for crawler tractors, are located in the rear compartment of the rear frame of the tractor, with the steering-clutch brakes immediately to the rear of the clutches. Accessibility of working parts, easy removal of such units as the clutch, transmission, steering-clutch brake, etc., for inspection and replacement, and removable cylinders are other features of the tractor.

New Ballast Working Attachments Add to Usefulness of Big Discer

FAIRMONT Railway Motors, Inc., Fairmont, Minn., has recently introduced a number of devices for attachment to the discing arms of its M23 big discer, which are designed to increase the efficiency, range of usefulness and economy of operation of this piece of equipment. These attachments may be fitted to all Fairmont M23 big discers now in service and, if desired, are supplied on new machines which are now offered with a wide selection of appliances adapted to the varying conditions of roadbed that are encountered on different roads.

One set of attachments, which is referred to as the "rooter," is designed to loosen the ballast in the shoulders of water-bound, rock-ballasted track in such a manner as to promote drainage. This set of attachments consists of a ballast plow for loosening or plowing up the

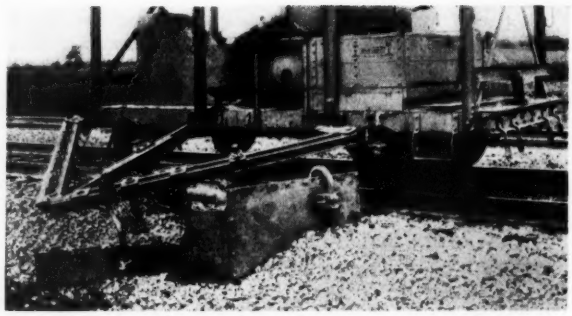


Ballast Plow, Under-cutter and Scarifier on the Fairmont M23 Big Discer

shoulder, three small prongs or scarifiers for separating the larger lumps of ballast, and an undercutter for reaching under the ends of the ties. All these points are made of manganese steel.

It is said that five trips over the track with this apparatus are sufficient thoroughly to loosen and crumble hard-packed rock ballast, even in extreme cases. In one case, where the work extended over several weeks, it was said that the cost of operating this equipment averaged $8.50 per mile of finished track, whereas the cost of doing the same type of work by hand methods on a test section amounted to $161 a mile.

Another attachment is a dresser box and blade for forming the ballast shoulder to the standard section. Grader blades are also furnished for the removal of old



Ballast Dresser Used After Thorough Agitation Has Renewed Drainage of Hard-Packed, Cemented Rock Ballast

ballast, or for spreading material that has been dumped from ballast cars. Four different sizes of discs are now available instead of the single size of 16-in. that was furnished with the first machines. The new sizes are 18-in., 20-in., and 22-in.

New Books

Engineers' Handbook

RAILROAD CURVES AND EARTHWORK (with tables) by C. Frank Allen, professor of railroad engineering, Massachusetts Institute of Technology. 540 pages, 4 in. by 7 in. illustrated. Bound in flexible fabricoid. Published by the McGraw-Hill Book Company, Inc., 370 Seventh Avenue, New York. Price $4.

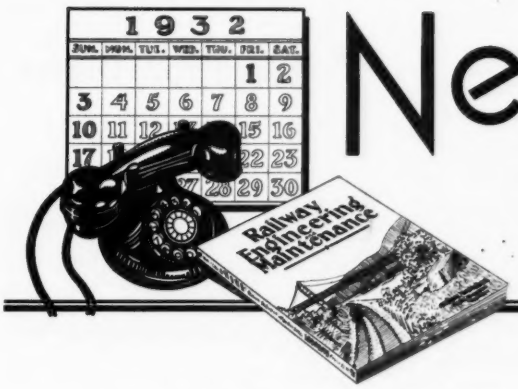
This constitutes the seventh edition of Allen's text on curves and earthwork and the fourth edition of Allen's tables, which appeared at one time as separate volumes. The text has been enlarged to include a chapter on the String Lining of Curves and the chapter on Turnouts has been materially revised and rearranged. Tables on Mean Refractions and Altitude and on Correction for Parallax and Refraction have been added, and a table of middle ordinates for a 45-ft. rail has been replaced by one for a 39-ft. rail.

A.R.E.A. Proceedings

PROCEEDINGS of the American Railway Engineering Association. 842 pages, illustrated, 6 in. by 9 in. Bound in cloth. Published by the Association, 59 East Van Buren Street, Chicago, Price $10.

This volume, which contains the proceedings of the 32nd annual convention which was held at Chicago on March 10-11, differs markedly from those of preceding years in size, containing only 842 pages as compared with 1858 pages in the previous year. This reduction was made possible in part by the condensation of the report of the Special Committee on Stresses in Track to 2 pages as compared with 271 pages in 1930. It is also the result of co-operative action by the various committees in preparing their reports more concisely and also carrying over subjects on which investigations had not been completed.

This volume contains the reports of the 27 standing and special committees, with the discussions thereon. It forms a valuable addition to the literature on current engineering and maintenance of way practices, these volumes constituting as they do the outstanding library of research on the problems in railway engineering.



News of the Month . . .

Air Traffic Gains

During the first 10 months of 1931, the number of passengers carried by American-operated air lines numbered 428,465, as compared with 417,505 during the entire year of 1930, according to the Aeronautics branch of the Department of Commerce. The number of passengers carried by scheduled air lines operating in the United States in October, according to reports from 35 of 40 companies, was 47,665; miles flown totaled, 4,183,793; express carried came to 66,672 lb.; and passenger-miles flown amounted to 10,587,389.

Grain Case Before Supreme Court

Argument was heard by the Supreme Court of the United States in the first week in December on the appeal taken by the Western railroads from the decision of the federal court at Chicago which refused their application for an injunction against the order of the Interstate Commerce Commission making a general downward revision of grain rates in the Western district. Briefs were filed by both the railroads and the commission. The principal point at issue was whether the commission's order regarding the grain rates was based on the same erroneous interpretation of the Hoch-Smith resolution that the court had condemned in the California citrus fruit case, as contended by the railroads, or whether the order was based on the Interstate Commerce Act, as maintained by the commission.

Denounces Operations of Government Barge Line

The Chamber of Commerce of the State of New York has adopted a resolution and report strongly denouncing the activities of the Inland Waterways Corporation, the government-owned barge line operating on the Mississippi river, and opposing any further expenditure of public funds for the benefit of this project. The resolution refers to the barge line as one "whose activities have aroused such general criticism from many quarters and have obliged the President of the United States by executive order to restrain certain forms of competition in which the corporation has engaged, e. g., in the matter of rates on cotton." The resolution asserts further that "the provision by the government of the navigable channels and locks and of their costs of maintenance is sufficient subsidization of this kind of transportation" without a further subsidization by the employment of public funds in operating the corporation at a loss, to the detriment of citizens engaged in the same business. It is declared in the resolution that the "corporation should retire from the field and leave it to citizens to whom it properly belongs."

Criticizes Commissioner for Public Ownership Views

In a recent address before the Bar Association of Baltimore, John J. Cornwell, general counsel of the Baltimore & Ohio, severely criticized Joseph B. Eastman of the Interstate Commerce Commission for the partiality to government ownership that he expressed in a speech before the American Academy of Political and Social Science, at Philadelphia. He called attention to the fact that Mr. Eastman had suggested that the time is not yet ripe for such control; "But can it be," Mr. Cornwell asked, "that Commissioner Eastman would ripen the situation by another decade of starved regulation of the railroads?" "Already," continued Mr. Cornwell, "his expressions have caused public utility and railroad securities, it is believed, to depreciate in the hands of the holders to the extent of several billions of dollars. Is it any wonder that holders of railroad securities become alarmed for their future? Would you place on guard before your house a policeman who was an open advocate of burglary? Does Commissioner Eastman discern no impropriety in his publicly condemning, even as a private citizen, a system which, as a high public official, he is under oath to administer according to the law of the land?"

Railroads Extend Highway Operations

The railroads are continuing to evince keen interest in the development of highway transportation, as is evidenced by the recent action of three roads in expanding their transportation operations in this field. The Central of Vermont has been authorized by the Vermont Public Service Commission to organize the Central Vermont Transit Corporation for the operation of motor trucks and buses in that state, while the Pennsylvania Public Service Commission has authorized the Reading Transportation Company, a subsidiary of the Reading, to extend its common carrier motor truck operations to 267 miles of additional routes. The latter company has also established interstate common carrier truck lines between Philadelphia, Pa., and New York and between Harrisburg, Pa., and New York. The Northern Pacific, through the Northern Pacific Transport Company, will shortly establish daily bus and truck service between Miles City, Mont., and Billings, 146 miles. This service will replace two rail motor cars now running between Glendive, Mont., and Billings.

October Freight Traffic Down 22.2 Per Cent

In October the Class I railroads handled 30,587,539,000 net ton-miles of freight, which was a reduction of 8,706,336,000 net ton-miles, or 22.2 per cent, as compared with October, 1930, according to reports compiled by the Bureau of Railway Economics. This was also a reduction of 36.1 per cent under the same month of 1929. In the first 10 months of this year the freight handled by these roads amounted to 292,404,224,000 net ton-miles, as compared with 360,788,963,000 net ton-miles in the same period of 1930, a reduction of 19 per cent. With a decrease of 20.1 per cent, the railroads in the Western district suffered the greatest loss, while in the Eastern district the decrease was 18.2 per cent and in the Southern district it was 18.7 per cent.

Excursion Rates Stimulate Passenger Traffic in Some Cases

Various plans for the stimulation of railroad passenger traffic are being tried by carriers in different parts of the country, with varying degrees of success. Among these, the "Dollar Day" plan of the Southern Pacific, in which excursion rates of one cent a mile are offered, has probably elicited the greatest response from the public. These excursions are offered generally simultaneously with holidays or state and local events of general interest. More than 50,000 round trip tickets were sold when the excursions were placed in effect over the Washington birthday week-end in Feb-

ruary, while similar results were attained with excursions operated during Easter, Mother's Day, Memorial Day and Labor Day.

Another form of excursion which was introduced during the summer months involved the use of Pullman sleeping cars on various railroads and attracted many patrons who used that service for the first time. On the other hand, all-expense tours from Chicago to the Pacific coast in July, operated jointly by the Chicago, Rock Island & Pacific and the Southern Pacific, and "family bargain rates" fixed on a sliding scale to induce the traveling of persons in groups at much less per individual than otherwise, which were offered in Southwestern Passenger Association territory, were not productive of great success. Railroads in the East have had commendable success with a low one-day Saturday, Sunday and holiday excursion rate between Philadelphia and coast resorts in southern New Jersey.

Commission Approves Loan Plan

The Interstate Commerce Commission has approved the plan submitted by the railroads for distributing the proceeds of the rate increase recently authorized by the commission as loans, instead of as gifts as proposed by the I.C.C. At a meeting in Washington, D. C., on December 11, the Association of Railway Executives agreed unanimously to recommend to the various railroads that they adopt the plan. Articles of incorporation for the Railroad Credit Corporation, which will administer the funds, were formally filed on December 14, at Wilmington, Del., by E. G. Buckland, chairman of the board of the New York, New Haven & Hartford, who has been elected president of the credit corporation. The rate increases, which the commission has estimated will amount to between $100,000,000 and $125,000,000 a year will become effective shortly after the first of the year and will expire on March 31, 1933.

Motorists and Railroads Have Common Cause

That the use of the public highways for the transportation of freight on a large scale is placing an increasingly heavy burden on the motorist, the general tax payer and the railroads was pointed out by T. F. Joyce, assistant vice-president of the Boston & Maine, in an article appearing in a recent issue of the Harvard Business School Alumni Bulletin. The article revealed that in the four New England states served by the Boston & Maine, expenditures for highways, streets and motor vehicle departments in 1929 were "double the amount of all revenues from motor vehicles; a fact which tends to establish that in these New England states, at least, it is the public at large rather than the actual highway users, who principally pay for the highways." In a table of figures presented to support this statement it is shown that highway expenses of $93,782,191 compared with revenues of all kinds from motor vehicle users amounting to $45,408,758. The article also called attention to the fact that, while motor trucks in 1930 increased 101,085 over 1929, passenger cars decreased 78,789, and that now there is a truck on the highways for every seven automobiles. "There has been no comprehensive study of the revolutionary conditions which have developed since 'horse and wagon' days," continued the article, "and we believe the private automobilist has common cause with the railroads in obtaining a fair consideration of the various phases of the problem involved."

Reading Undertakes Extensive Improvement Program

Believing that the present is "an opportune time to place large contracts as a stimulus to industry and to provide employment where so urgently needed," the Reading, through Agnew T. Dice, president, has announced that it will shortly undertake an extensive improvement program involving a total expenditure of more than $4,000,000. The major items of the program include the immediate extension of electrified passenger service between Philadelphia, Pa., and Morristown, the construction of 30 multiple-unit electric passenger coaches and 20 passenger coach trailers, the erection of a new pier at Port Richmond, Pa., and extensive locomotive rebuilding at Reading, Pa. "The placing of these contracts," said Mr. Dice, "involving many millions of dollars, will insure work to several thousand men during the winter months."

I. C. C. Makes Annual Report

In its annual report to Congress, the Interstate Commerce Commission, in addition to making a number of recommendations for railroad legislation, reiterated its belief that the most effective remedy for the difficulties of the railroads will be the "economic recovery of the country," stating that "when business conditions begin to improve, railroad traffic and earnings will improve in harmony with them, just as they have done in the past."

Among other matters discussed, the commission recommended in its report that Congress provide for "an impartial and authoritative investigation for the purpose of determining whether and to what extent motor, water and air carriers operating in competition with the railroads are receiving direct or indirect government aid, amounting, in effect, to a subsidy; and, if so, what steps, if any, are necessary to correct this situation, with a view to placing competition on a just and equitable basis." Furthermore, "recognizing that, because railroad earnings will inevitably fall below the standard level in times of business depression, they may properly be permitted to rise above it in times of prosperity," the commission recommended repeal of the recapture provisions of the Interstate Commerce Act and the substitution of a "modified rule" of rate regulation for that now in effect.

Association News

Bridge and Building Association

At a meeting of the Executive committee in Chicago on December 5, it was decided to appoint two additional committees to undertake the study of new subjects—Electrical Pumping Equipment and Building Records. These committees are an addition to the eight that were appointed a year ago whose reports will be presented at the convention next fall.

Maintenance of Way Club of Chicago

H. R. Clarke, general inspector of permanent way, Chicago, Burlington & Quincy, was the speaker at a meeting on December 16, which was attended by 66 members and guests. He described the new track maintenance organization of the Chicago, Burlington & Quincy, an abstract of his remarks appearing on page 39 of this issue. The next meeting of the club will be held on January 20, when Armstrong Chinn, chief engineer of the Alton, will be the speaker.

Wood-Preservers' Association

Arrangements for the program of the twenty-eighth annual meeting of the American Wood-Preservers' Association, which will be held at the Jefferson hotel, St. Louis, Mo., on January 26-28, have been completed. The following is a summary of those features of the program which are of interest to railway men:

On Tuesday morning, January 26, in addition to the usual opening business, L. W. Baldwin, president of the Missouri Pacific, will address the meeting on The Railway Industry's Interest in Treated Timber. Tuesday afternoon will be devoted to committee reports, including the report of the Committee on Car Lumber.

Included in the program for Wednesday morning are committee reports on Bridge and Structural Timber, Tie Service Records, and Pole Service Records and three papers by railway officers, as follows: Thirty-two Years Experience with Treated Ties, by J. S. McBride, chief engineer, Chicago & Eastern Illinois; Creosoted Pile Foundations for Railway Structures, by F. R. Judd, engineer of buildings, Illinois Central; Treatment of Bridge Timber and Piling on the Sante Fe by R. A. Van Ness, bridge engineer A. T. & S. F. System. The final session on Thursday morning will be devoted to reports and papers on the more technical problems of wood preservation.

Ballots have been distributed to the members carrying the following nominations for officers for the year beginning at the conclusion of the annual meeting on January 28: President, Elmer T. Howson, editor, *Railway Engineering and Maintenance*, Chicago; first vice-president, R. S. Belcher, manager treating

plants, A. T. & S. F., Topeka, Kan.; second vice-president, S. R. Church, consulting engineer, New York; secretary-treasurer, Horace L. Dawson, Washington, D. C.; executive committee, F. C. Shepherd, consulting engineer, B. & M., Boston, Mass., and B. M. Winegar, Canada Creosoting Company, Montreal, Que.

American Railway Engineering Association

Ballots, containing the names of members of the association who have been offered by the Nominating committee as candidates for election as officers, directors and members of the Nominating committee, have been mailed to the corporate members of the association. The result of the election, however, will not be announced until the convention in March. The nominations are as follows:

President, J. V. Neubert, chief engineer maintenance of way, N. Y. C.

Second vice-president, J. E. Armstrong, assistant chief engineer, C. P. R.

Treasurer, A. F. Blaess, chief engineer, I. C.

Secretary, E. H. Fritch.

(In addition, W. P. Wiltsee, chief engineer, N. & W., will be automatically advanced from second vice-president to first vice-president.)

Directors (three to be elected) H. Austill, bridge engineer, M. & O.; E. M. Hastings, chief engineer, R. F. & P.; J. C. Irwin, valuation engineer, B. & A.; F. R. Layng, chief engineer, B. & L. E.; E. R. Lewis, principal assistant engineer, M. C.; A. N. Reece, chief engineer, K. C. S.; L. S. Rose, general manager, P. & E.; J. R. Watt, general roadmaster, L. & N.; A. R. Wilson, engineer bridges and buildings, Pennsylvania.

Members of Nominating committee (five to be elected): W. C. Barrett, trainmaster, L. V.; C. B. Bronson, assistant inspecting engineer, N. Y. C.; E. L. Crugar, chief engineer, Wabash; W. T. Dorrance, assistant to chief engineer, N. Y. N. H. & H.; M. Hirschthal, concrete engineer, D. L. & W.; W. L. Morse, special assistant engineer, N. Y. C.; C. P. Richardson, engineer of track elevation, C. R. I. & P.; J. W. Orrock, engineer of buildings, C. P. R.; A. L. Sparks, architect, M-K-T; R. C. Young, chief engineer, L. S. & I.

Bulletin No. 340, containing five of the committee reports, is now in the hands of the members and a second bulletin containing five additional reports will be mailed during the first week in January. The remaining committee reports are in the hands of the printers. Approximate estimates indicate that the total volume of the committee reports will exceed slightly that of the reports presented at the convention in 1931.

No meetings of committees were held during December and none have been scheduled for January. Several committees expect, however, to hold meetings during the month for the purpose of organizing their work for the new year, which is now possible since Bulletin 340 also contains the assignment of work and personnel of committees for the coming year.

Personal Mention

General

Raymond D. Starbuck, vice-president in charge of operation of the New York Central Lines, who has had broad training and experience in the engineering field and who at one time was assistant chief engineer of the Michigan Central, has been promoted to executive vice-president, with headquarters as before at New York. Mr. Starbuck was born on July 26, 1878, at Fort Ann, N. Y., and was educated at Cornell University. He entered railway service in January, 1903, as an assistant engineer on the Michigan Central. In June of the following year he was promoted to division engineer, and a year later was appointed assistant chief engineer. In June, 1912, Mr. Starbuck was appointed special engineer to the assistant vice-president of the New York Central Lines, and in April of the following year he was promoted to special engineer to the vice-president. In February, 1915, he was appointed special engineer to the president, and in January of the following year he became special engineer to the vice-president of the New York Central Railroad. In May, 1916, he was promoted to assistant to the vice-president. In February of the following year he was appointed assistant

Raymond D. Starbuck

general manager of the lines west of Buffalo and during federal control he served as assistant federal manager of the same lines. Later Mr. Starbuck served for a time as assistant regional director of the Eastern region for the Railroad Administration. At the termination of federal control he was appointed assistant vice-president of the New York Central Railroad, later being appointed also to the same position on the Ohio Central Lines. Mr. Starbuck was appointed vice-president in charge of operations in April, 1924. In April, 1931, his jurisdiction was extended to include the Cleveland, Cincinnati, Chicago & St. Louis and the Michigan Central.

Ralph Budd, president of the Great Northern and formerly chief engineer and assistant to the president of that road, has been elected president of the Chicago, Burlington & Quincy, with headquarters at Chicago. Mr. Budd has been associated with the engineering and maintenance of way departments of a number of roads during his railway ca-

Ralph Budd

reer of 32 years. He was born on August 20, 1879, at Waterloo, Iowa, and graduated from Highland Park College, Des Moines, in 1899. In that year he entered railway service in the engineering department of the Chicago Great Western, serving in several capacities, including that of assistant engineer, until 1902, at which time Mr. Budd left this road to go with the Chicago, Rock Island & Pacific as a roadmaster, serving until 1906 in this position and as general superintendent of construction and division engineer. In the latter year he was appointed chief engineer of the Panama Railroad, with headquarters at Colon, Panama. Three years later he returned to this country as chief engineer of the Oregon Trunk, the Spokane, Portland & Seattle and the Spokane & Inland Empire. In 1913, he was appointed assistant to the president and chief engineer of the Great Northern, being elected executive vice-president in 1918. A year later he was elected president, with headquarters at St. Paul, Minn. During the summer of 1930, Mr. Budd made an extensive inspection trip over the Russian railways at the request of the Soviet government, and acted as an adviser on many problems of railway construction and operation which the Russian railways had encountered.

J. W. Thomas, assistant trainmaster and roadmaster on the Buchanan branch of the Norfolk & Western, with headquarters at Woodman, Ky., has been promoted to assistant superintendent of the Shenandoah division, with headquarters at Roanoke, Va. Prior to his

appointment as assistant trainmaster and roadmaster in 1928, Mr. Thomas had served in the maintenance of way department of the Norfolk & Western for 21 years. He was born on September 28, 1888, at Lebanon, Va., and entered the service of the Norfolk & Western in 1905 as a trackman. On May 1, 1906, he was promoted to track foreman, which position he held until November 28, 1912, when he was transferred to the operating department as a brakeman. Mr. Thomas returned to the maintenance of way department on June 21, 1915, as an assistant extra-gang foreman, being promoted to roadmaster about a year later. He served in this position and as an assistant roadmaster until December 15, 1928, when he was made assistant trainmaster and roadmaster on the Buchanan branch. He held this position until his recent promotion to assistant superintendent of the Shenandoah division.

L. L. Morton, whose appointment as superintendent of the Montgomery & New Orleans division of the Louisville & Nashville at Louisville, Ky., was noted in the November issue, has risen through the engineering department. He was born on April 2, 1884, at Mt. Eden, Ky., and was graduated from Centre College in 1905, with a degree in civil engineering. He entered railway service in June, 1906, in the engineering department of the Atlanta, Birmingham & Atlantic (now the Atlanta, Birmingham & Coast). He left this road in 1909, to become an assistant engineer on the Kansas City Southern, at Texarkana, Tex., and in 1912, he accepted a similar position in the office of the chief engineer of the Louisville & Nashville. During the World War, Mr. Morton served in the United States Army successively as a captain, major and lieutenant-colonel of engineers. He returned to the service of the L. & N. in 1919, and in 1920, he was made a special engineer at Louisville, Ky. Eight years later Mr. Morton was promoted to superintendent of the New Orleans and Mobile division, with headquarters at New Orleans, La., and in June of this year, when this division was combined with the Montgomery division, under the name of the Montgomery and New Orleans division, Mr. Morton was appointed superintendent of the new division, with headquarters at Mobile, Ala. He retained this position until his recent appointment as assistant general manager, effective October 15.

Engineering

Effective January 1, the engineering forces of the Alton were reorganized to conform to the divisional type of organization, involving the creation of the positions of division engineer and assistant division engineer and the abolition of the position of general roadmaster. **A. F. Kadow,** assistant engineer, with headquarters at Chicago, has been appointed division engineer of the Eastern division, with headquarters at Bloomington, Ill., while **M. Donahoe,** general roadmaster, with headquarters at Chicago, has been appointed division engineer of the Western division, with headquarters also at Bloomington. **L. E. Thornton** and **R. H. Washburn,** assistant engineers at Chicago, have been appointed assistant division engineers of the Eastern and Western divisions, respectively, both with headquarters at Bloomington.

J. B. Mabile, supervisor of work equipment of the Chicago, Rock Island & Pacific, with headquarters at Chicago, has been appointed to the newly-created position of general maintenance inspector, with headquarters at the same point, and the position of supervisor of work equipment has been discontinued.

Following the merging of the El Paso division of the Southern Pacific Lines in Texas and Louisiana with the San Antonio division, **J. H. Knowles,** division engineer of the former division, with headquarters at El Paso, Tex., has been transferred to the San Antonio division, with headquarters at San Antonio, Tex., where he succeeds **C. M. Staples,** who has been transferred to the Houston division, with headquarters at Houston, Tex. Mr. Staples replaces **G. A. Boyer,** who has been appointed assistant division engineer at San Antonio.

In consequence of a rearrangement of divisions on the Northern Pacific, effective January 1, in which three divisions were eliminated and absorbed by other divisions, the territories of the district engineers have been revised somewhat. In the changes among divisions, the Dakota division was absorbed by the Fargo division and a portion of the latter division was assigned to the St. Paul division. That part of the Montana division east of Livingston, Mont., has been assigned to the Yellowstone division and the portion west of this point will become a part of the Rocky Mountain division. The Seattle division has been merged with the Tacoma division. The jurisdiction of **S. J. Taylor,** district engineer, with headquarters at St. Paul, Minn., will now include the Lake Superior, St. Paul, Fargo and Yellowstone divisions, while **H. M. Tremaine,** district engineer, with headquarters at Spokane, Wash., will have jurisdiction over the Rocky Mountain and Idaho divisions. The jurisdiction of **G. I. Hayward,** district engineer at Seattle, Wash., will include the Pasco and Tacoma divisions.

The Adirondack division of the New York Central, including the Ottawa branch, has been combined with the Mohawk division and is now maintained under the direction of **A. R. Jones,** division engineer of the Mohawk division, with headquarters at Albany, N. Y. The Rochester division has been combined with the Syracuse and Buffalo divisions, under the jurisdiction of **P. H. Winchester,** division engineer of the Syracuse division, at Syracuse, N. Y., and **B. M. McDonald,** division engineer of the Buffalo division, at Buffalo, N. Y. The jurisdiction of the Electric division, New York City, has been extended to include that territory from Spuyten Duyvil to St. Johns Park, known as the Thirtieth Street branch, excluding docks and piers at New York City, formerly on the Eastern division. These docks and piers have been included under the jurisdiction of the River division. The positions of division engineer of the Rochester and Adirondack divisions; supervisor of piers and buildings, Eastern division; supervisor of bridges and buildings of the Rochester and Adirondack divisions; and supervisor of track, Subdivision 22-A, Mohawk division and Subdivision 15, Rochester division have been abolished.

Track

R. F. Lechner, track foreman on the Minneapolis & St. Louis, at Olds, Iowa, has been appointed assistant supervisor of track, with headquarters at Oskaloosa, Iowa, which position he will hold during the winter months because of the illness of **F. J. Svec,** supervisor of track at Oskaloosa.

James Watt, roadmaster on the Chicago & North Western, with headquarters at Cedar Rapids, Iowa, has had his jurisdiction extended to include the territory between Clinton, Iowa, and Anamosa, succeeding **M. J. Deltgen,** roadmaster, with headquarters at Clinton, Iowa, who has retired from active service.

J. W. Gilliam, roadmaster on the Illinois division of the Missouri Pacific, with headquarters at Chester, Ill., has been transferred to Bonne Terre, Mo., where he has jurisdiction over that part of the Missouri-Illinois Railroad (part of the Missouri Pacific) west of the Mississippi river. Mr. Gilliam succeeds **C. H. Flint,** who has retired from active service.

Paul M. Valde, roadmaster on the Regina division of the Canadian National, with headquarters at Moose Jaw, Sask., has been transferred to the Melville division, with headquarters at Melville, Sask., where he succeeds **Charles W. Tyson,** whose retirement was noted in the December issue. The territory over which Mr. Valde formerly exercised jurisdiction has been distributed among other roadmasters. **S. W. Leeper,** division engineer of the Saskatoon division, with headquarters at Saskatoon, Sask., has been appointed also acting roadmaster at that point, succeeding **C. F. Werseen,** deceased.

A. L. Anderson, track foreman on the Canadian Pacific with headquarters at Revelstoke, B. C., has been promoted to roadmaster on the Kettle Valley division, with headquarters at Penticton, B. C., to succeed **W. H. Kirkpatrick,** who has been transferred to the Revelstoke division, with headquarters at Lake Windermere, B. C., where he succeeds **S. Kozak.** Mr. Kozak has been transferred to Grand Forks, B. C., to replace **H. R.** Anderson, who has been transferred to the Revelstoke division, with headquarters at Revelstoke, to succeed **J. Graham,** who has retired. **G. L. Thorne,** relieving roadmaster, has been appointed road-

STOP–LOOK–CONSIDER

MILLIONS in *SERVICE*

Can you answer YES to the following questions relative to the rail anchor you are now using?

W

Does it prevent rail creeping effectively?
Is the cost of application low?
Can it be efficiently reapplied?
Does it prevent damage to the ties?
Is it damage-proof in case of derailment?

W

The reason for there being millions of Woodings Anchors in service is because they answer YES to the above questions

WOODINGS FORGE & TOOL CO.

WORKS AND GENERAL OFFICES

VERONA, PENNA.

master on the Brandon division, with headquarters at Reston, Man., to succeed **A. Anderson,** who has been transferred to Souris, Man., where he replaces **S. Benson,** who has been granted a leave of absence.

P. W. Early, assistant supervisor of track on the Middle division of the Pennsylvania, with headquarters at Newport, Pa., has been promoted to supervisor of track on the Baltimore division, with headquarters at York, Pa. **H. W. Manning,** supervisor of track, with headquarters at Jamaica, L. I., has been transferred to Atlantic City, N. J., and Subdivision No. 3, on which he was supervisor, has been abolished and consolidated with the other four divisions of the Long Island. **J. S. Snyder,** track supervisor on the New York division of the Pennsylvania, with headquarters at Phillipsburg, N. J., has been transferred to the Cincinnati division, with headquarters at Anderson, Ind., succeeding **C. R. McNary,** who has been assigned to other duties. Patrick Fannon, supervisor of track on the Cincinnati division, with headquarters at Cincinnati, Ohio, has retired from active service. **J. J. Clutz,** supervisor of track, with headquarters at Hollidaysburg, Pa., has been transferred to Jamesburg, N. J.

Effective January 1, following a rearrangement of the engineering and maintenance of way forces of the Alton, the positions of roadmaster were abolished and all roadmasters were appointed supervisors of track. **J. P. Corcoran,** roadmaster at Bloomington, Ill., has been appointed supervisor of District No. 2 of the Eastern division with the same headquarters, and **F. L. McMillan,** also roadmaster at Bloomington, has been appointed supervisor of District No. 3, with headquarters at the same point. **M. H. Murphy,** roadmaster at Slater, Mo., has been appointed supervisor of District No. 8 of the Western division, with the same headquarters. **M. Laffey,** supervisor at Springfield, Ill., has been transferred to District No. 6 of the Western division with headquarters at Roodhouse, Ill. **G. Meyers,** supervisor at Slater, Mo., has retired.

Bridge and Building

N. M. Brown, supervisor of bridges and buildings of the Huntsville division of the Nashville, Chattanooga & St. Louis, with headquarters at Tullahoma, Tenn., has been transferred to Marietta, Ga., to succeed **John W. Hooper,** whose death is noted elsewhere in these columns.

E. Gephart and **C. E. Horrom,** supervisors of bridges and buildings of the Eastern and Western divisions of the Alton, with headquarters at Bloomington, Ill., and Slater, Mo., respectively, have had their titles changed to that of master carpenter, both with headquarters at Bloomington.

J. D. Kelly, supervisor of bridges and buildings of the Dallas division of the Southern Pacific Lines in Texas and Louisiana, with headquarters at Ennis, Tex., has had his territory extended to include the Austin division, succeeding **W. R. Hale,** supervisor of bridges and buildings, with headquarters at Austin, Tex., who has been assigned to other duties. Following the merging of the El Paso division with the San Antonio division, **C. Black,** supervisor of bridges and buildings of the former division with headquarters at El Paso, Tex., has been transferred to the San Antonio division with headquarters at San Antonio, Tex., where he succeeds **Robert Huebel,** who has also been assigned to other duties.

Obituary

John W. Hooper, supervisor of bridges and buildings of the Atlanta division of Nashville, Chattanooga & St. Louis, with headquarters at Marietta, Ga., died on November 23.

Charles N. Kalk, who retired in 1917 as chief engineer of the Minneapolis, St. Paul & Sault Ste. Marie, with headquarters at Minneapolis, Minn., died on December 7, at Seattle, Wash., at the age of 71 years.

Charles H. Koyl, engineer of water service of the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Chicago, died on December 18, of bronchial pneumonia, at the St. Francis hospital, Evanston, Ill. Mr. Koyl had been a student of the treatment of water for railroad use since about 1900 and was

Charles H. Koyl

the designer of some of the first water-treating plants to be constructed in this country. He was born on August 14, 1855, at Amherstburg, Ont., and graduated from Victoria College, Cobourg, Ont., in 1877. From 1881 to 1883 he attended Johns Hopkins University as a fellow in physics, later serving as a professor of physics at Swarthmore College. Mr. Koyl engaged in consulting engineering work in New York City from 1890 to 1909. In 1912, he was engaged by James J. Hill to inaugurate a water-treating program on the Great Northern and served this road as engineer of water service, with headquarters at St. Paul, Minn., until January 1, 1920, when he entered the service of the Milwaukee.

Supply Trade News

General

The Ames-Baldwin-Wyoming Shovel Company has moved its general offices from North Easton, Mass., to Parkersburg, W. Va. All the chief executive officers of the company now have their headquarters at Parkersburg. The company will operate plants at North Easton, Parkersburg, Alton, Ill., Anderson, Ind., and Pittsburgh, Pa.

The Weir Kilby Corporation, Cincinnati, Ohio, and Birmingham, Ala., has acquired the **Cincinnati Frog & Switch Company,** Cincinnati. **Charles H. Partington,** president of the Cincinnati Frog & Switch Company has resigned and **O. DeG. Vanderbilt, Jr.,** president of the Weir Kilby Corporation, has been elected president also of the Cincinnati Frog & Switch Company. The business of the latter company will be carried on as in the past.

The Wellman Engineering Company, Cleveland, Ohio, has acquired the clam shell bucket and heavy-duty trailer business of the **G. H. Williams Company,** Erie, Pa., including good-will, drawings, patterns, inventions, patents, etc. The engineering, manufacture and sale of these buckets and trailers will be transferred to the Wellman Engineering Company plant at Cleveland. **W. C. Swalley,** secretary and general manager; **A. J. Lichtinger,** assistant manager; **C. F. Weiblen,** sales manager and **P. T. Robin,** chief engineer of the Williams Company at Erie, will be associated with The Wellman Engineering Company at Cleveland in the manufacture and sale of this equipment.

Personal

James F. Prendergast, president and treasurer of the **Prendergast Company,** Marion, Ohio, died on November 15 at his home in Marion at the age of 68.

The Barber Asphalt Company on January 1 transferred the headquarters of **W. J. Schlacks,** special railroad representative, from 722 Chestnut street, St. Louis, Mo., to 7 South Dearborn street, Chicago.

Thomas J. Harte, assistant general sales manager of the **North American Cement Corporation,** Albany, N. Y., has been elected vice-president and general sales manager, to succeed **Frederick A. Boeye,** deceased. Mr. Harte will have his headquarters as before at New York.

R. H. Gardner, manager of the Washington (D. C.) office of the **Caterpillar Tractor Company,** Peoria, Ill., has been promoted to assistant sales manager, at Peoria, succeeding **W. H. Goodwin,** who has been assigned to special work under the vice-president in charge of sales.

TIE TAMPING

with a "Caterpillar"

A DAVEY Air Compressor is mounted on this "Caterpillar" track-type Tractor. The outfit goes anywhere—*on its own tracks!* It supplies the air for three tampers. It cuts costs—speeds the work—does jobs better. And it lends itself to a score of other money-saving uses. Railroad men are finding all sorts of uses for a "Caterpillar"—the 'cross-country locomotive!

Prices—f. o. b. Peoria, Illinois

TEN	$1100	THIRTY	$2375
FIFTEEN	$1450	FIFTY	$3675
TWENTY	$1900	SIXTY	$4175

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

Track-type Tractors Combines Road Machinery

(There's a "Caterpillar" Dealer Near You)

CATERPILLAR

REG. U. S. PAT. OFF.

TRACTOR

Paul Weeks, general service manager at Peoria, succeeds Mr. Gardner at Washington. **J. N. Barnes, C. M. Burdette** and **F. G. Nunnelly,** have been appointed district sales managers in charge of district representatives and a group of dealers. Mr. Barnes was district representative for the territory around Macon, Ga., Mr. Burdette was formerly with the Hyatt Roller Bearing Company and Mr. Nunnelly represented the Caterpillar Tractor Company in Canada.

William W. Blackburn, from 1901 to 1927 vice-president and secretary of the Carnegie Steel Company, Pittsburgh, Pa., who retired from active business in 1927, died at Pittsburgh on December 11, after a prolonged illness.

J. E. Schabo, for the past four years with the Binks Manufacturing Company, Chicago, and prior to that for many years with the DuPont organization, has been appointed secretary of the **Modern Supply Company,** Chicago, representatives of a number of companies handling railroad and industrial painting and finishing materials.

The Railroad Materials Corporation, 30 Church street, New York, has been organized by **H. M. Buck** as president and **A. H. Smith** as vice-president. Mr. Buck was formerly vice-president and Mr. Smith was formerly sales representative of the Railroad Supply Company with headquarters at New York. The new organization will act as sales representatives of manufacturers of railway supplies.

Col. R. H. Morse, formerly vice-chairman of the board of **Fairbanks, Morse & Co.,** Chicago, has been elected president and general manager to succeed **W. S. Hovey**, resigned. Col. Morse was born at Chicago on December 6, 1878, and in 1895, entered the employ of Fairbanks, Morse & Co., the firm founded by his father, C. H. Morse. Here he began his career with the company as an apprentice at the Beloit factory (then known as Fairbanks-Morse Manufacturing Company) and, except during his military service, when he was lieutenant-colonel in the Signal Corps, he has been with the company continuously since that time. In the 36 years, he has been employed in various positions as salesman, department manager, branch house manager, sales manager, president of the manufacturing division, vice-president in charge of purchases, first vice-president, vice-chairman of the board and now president and general manager. Col. Morse is also a director of E. & T. Fairbanks & Co., the Canadian Fairbanks-Morse Co., Ltd., the E. & T. Fairbanks & Co., Ltd., and the Central Republic Bank and Trust Company.

Col. R. H. Morse

Shortly after graduating from Cornell University, Mr. Hovey became assistant superintendent of the Sheffield Car Company, one of the early subsidiaries of Fairbanks, Morse & Co. He later became superintendent, which position he held until 1913, when he was made manager of the Engine division of the Beloit plant. A few months later he was promoted to general manager of the Beloit Works and in 1919, he was elected vice-president in charge of manufacturing activities. In 1924 he was made vice-president and general manager and in 1927, he was elected to the presidency.

W. S. Hovey

Trade Publications

Aluminum Fence.—A booklet, entitled "Why Aluminum Fence," containing an outline of the development of aluminum and its application to the manufacture of fencing, has recently been issued by the Page Steel & Wire Company, Bridgeport, Conn.

The Border Patrol.—An illustrated booklet bearing this title and containing various style sheets of chain link and wrought iron picket fences has recently been issued by the Page Steel & Wire Company, Bridgeport, Conn.

Armco Culverts.—Catalogue No. 6 of the Armco Culvert Manufacturers Association bears this title and is in effect a pictorial description of the various applications of Armco culverts. This booklet contains 24 pages.

Creosoted Poles—The International Creosoting & Construction Co., Galveston, Tex., has issued a 16-page, illustrated booklet, setting forth the advantages of creosoted pine poles and pointing out, especially, the fact that by reason of advances in treating equipment and the science of timber preservation, the poles now treated will not "bleed" after being installed, and thereby damage the clothing of persons who may come in contact with them. As proof of this statement, the booklet lists the names of 1,500 cities in the United States where creosoted pine poles are in service in streets of business and residential sections.

Welding Rod and Equipment.—A folder illustrating and describing the newer types of welding rods and equipment and bearing this title has been issued by Joseph T. Ryerson & Son, Inc., Chicago.

New Excavator.—The Bucyrus-Erie Company, South Milwaukee, Wis., has published a 26-page catalog describing and illustrating its new 32-B, one-yard excavator, convertible to shovel, dragline, clamshell or crane.

Caterpillar Excavating Equipment—The Caterpillar Tractor Company, Peoria, Ill., has issued two folders, one describing the Caterpillar Sixty elevating grader and the other, the Caterpillar Twenty leaning wheel grader.

Armco Spiral Welded Pipe.—The American Rolling Mill Company, Middletown, Ohio, has recently issued a 40-page booklet containing much useful information relative to this company's spiral welded pipe. The booklet is profusely illustrated.

For Wood Preservation—The Curtin-Howe Corporation, New York, has published an eight-page pamphlet, bearing this title, which contains a complete explanation of the various applications of ZMA wood preservative. The pamphlet also explains how this wood preservative acts to destroy organisms that attack wood.

Inland Open-Hearth Sheet Steel Products.—The Inland Steel Company, Chicago, has issued a new edition of its booklet bearing this title, which contains all the information ordinarily needed for ordering steel sheets. The booklet, which contains 56 pages, also carries concise descriptions of all Inland sheet steel products.

Power Pumps. The Worthington Pump & Machinery Corporation, Harrison, N. J., has issued a specification sheet covering its horizontal, duplex piston-pattern power pumps designed for general service. This sheet includes not only specifications of the pumps, but also contains a description of them and their parts, and lists the sizes and capacities in which they can be furnished.

Steel Sheet Piling.—The Carnegie Steel Company, Pittsburgh, Pa., has issued a 92-page, attractively bound catalogue, describing and illustrating in detail the complete series of Carnegie steel sheet piling sections. The catalogue contains many tables and a large amount of data having direct bearing on steel sheet piling and piling installations, and also, information on earth and water pressures, useful in determining the resultant loadings to which piling is subjected.

A Proved American Track Construction

IN these days of heavy traffic and high speeds, maintenance costs are more than ever an item of serious consideration.

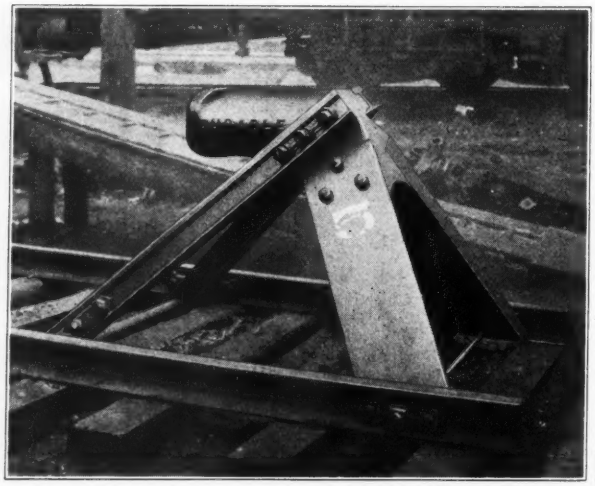
The Neafie Rail Joint with its heavy broad base plate constitutes a great stride toward permanent track construction and therefore an active agency of economy and at nominal cost.

In addition to its characteristics of permanence, it is a tie saver and a labor saver.

These facts have been demonstrated over the past eight years.

THE RAIL JOINT COMPANY
165 Broadway—New York

KEEP 'EM ON THE TRACK



THE DURABLE MODEL D

(Patented Aug. 3rd, 1920, Pat. No. 1348223, Other Patents Pending)

Like the other members of the DURABLE Bumping Post family, the Model "D" has massive, immovable strength that can always be depended upon to keep your cars on the rails—and in addition it can be used with equal success in freight or in passenger service.

All parts of the DURABLE Bumping Post are above the ground. It is as easy to install in winter as in summer, because there is no digging—a point that is appreciated most in winter when the ground is frozen iron hard.

There is no need to postpone necessary protection of track ends because of the season, or for any other reason. The DURABLE is always available, and it's just as easy to put in now as during the warmer weather.

Mechanical Manufacturing Company

Union Stock Yards, Chicago, Ill.

(Also Manufacturers of the Ellis Post)

Creo-pine
CREOSOTED SOUTHERN PINE
TRADE MARK REG.

The name Creo-pine on creosoted southern pine is more than a trade mark. It is a pledge of honest, accurate manufacture and rigid inspection from standing tree to finished product. Back of it are 24 years of wood preserving experience.

Always Ready to Fill Rush Orders

for finest grade Cross Ties

Creo-Pine products include:

Poles
Piling
Conduit
Cross Ties
Cross Arms
Floor Blocks
Sub-Flooring
Bridge Timbers
Structural Timbers

UNUSUAL treating advantages, high and dry storage yards and ample railroad facilities assist us in making prompt shipment of highest grade creosoted cross ties—pine from Georgia and Alabama, red oak from Tennessee. We can supply large or small quantities at a minimum production cost from our two plants, at East Point, Georgia, and Chattanooga, Tennessee. All ties are creosoted by the vacuum-pressure method, assuring deep and uniform penetration, long life and lowest cost per year of service. Let us know your requirements.

SOUTHERN WOOD PRESERVING CO.
ATLANTA, GA.

Treating Plants **EAST POINT, GA., *and* CHATTANOOGA, TENN.**

Sales Offices:

NEW YORK 10 EAST 43rd ST. | PHILADELPHIA LAND TITLE BLDG. | PITTSBURGH DOLLAR SAVINGS & TRUST BLDG. | DETROIT BUHL BLDG.
CHATTANOOGA | CHARLOTTE, N.C. BUILDERS BLDG. | TOLEDO

Since 1836

PIONEERS *in* ADVANCED ENGINEERING PRACTICE

Welded Steel Drop Housing

THE base plate, housings and gear cases on this Southwark Bending Roll are built up from welded steel material. This construction gives lighter weight and greater strength.

In being the first to use welded material in the construction of Bending Rolls, Southwark is maintaining its traditional policy of adapting the latest and most advanced engineering practice to its products.

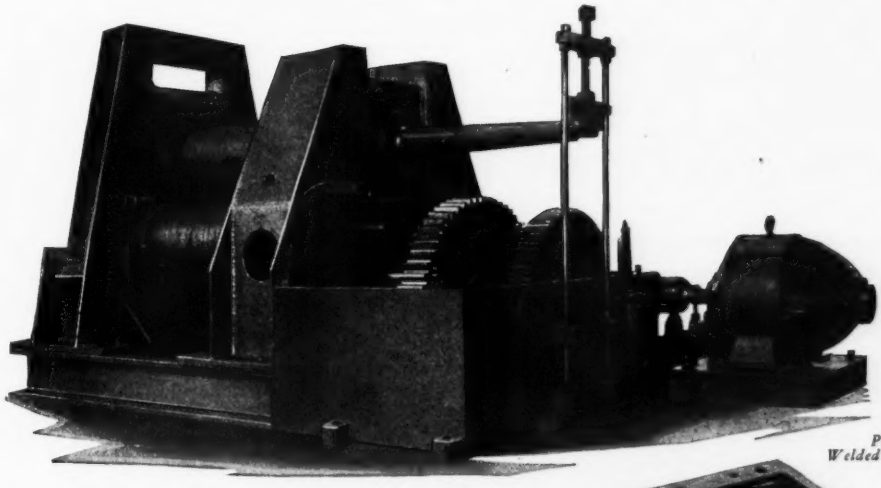


Plate Bending Roll. Welded Steel Plate Construction.

Southwark Railroad Shop Equipment

Hydraulic Presses for Flanging, Forging, etc. Power Punches and Shears. Plate Bending Rolls, Plate Planers, Hydraulic Riveters and General Boiler Shop Equipment.

Southwark Railway Track Scale Test Cars *are the* Standard

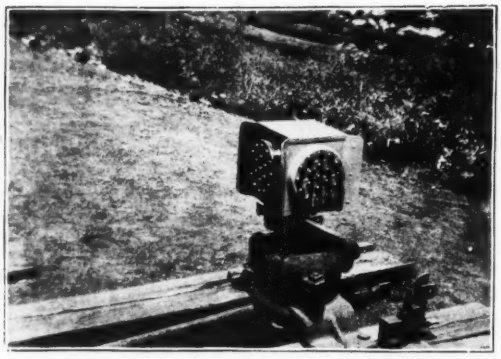
Gear Case Welded Steel.

BALDWIN-SOUTHWARK CORPORATION
SOUTHWARK FOUNDRY AND MACHINE CO.

CHICAGO **SOUTHWARK** AKRON
PHILADELPHIA

REFLEX SWITCH LAMPS

Do you know what it costs you per year to maintain oil lamps on your switch stands? **Thousands of Dollars.**



Far sighted engineers are eliminating this expense as much as possible by substituting a reflector lamp for the oil lamp. The Reflex lamp shown here was developed less than a year ago and there are now several hundred of them in service on railroads. They require no maintenance. The first cost is the last cost, and this is very reasonable. Caution and proceed signs, grade markers and other signal devices are now being equipped with Reflex lens.

Louisville Frog, Switch & Signal Co.

Louisville, Kentucky

Send For Your Copy NOW!

The series of articles on *"The Operation and Maintenance of Track Motor Cars,"* by C. R. Knowles which appeared serially in Railway Engineering and Maintenance from January, 1930 and concluded with the May 1931 issue have been reprinted in booklet form of 68 pages, bound in an attractive cover.

This series of articles, 15 in number, contains a vast fund of practical information on the design, use and care of motor cars that has long been sought by maintenance men.

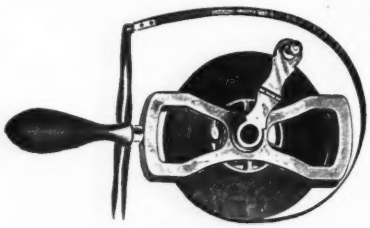
These booklets are now available at 50 cents per copy.

SEND FOR YOUR COPY NOW

TO

RAILWAY ENGINEERING AND MAINTENANCE

105 West Adams Street **Chicago, Illinois**



"Michigan" Chain Tapes

Sturdy tapes 5/16" wide. Built for hard use. Regularly carry blank space but furnished measuring from end of ring if specified. Half-gauge marks when requested.

FOR ACCURACY and SERVICE

LUFKIN

TAPES, RULES and TOOLS

With them correct measurements are assured—whether in shop, engineering, or construction work.

Send for Catalog.

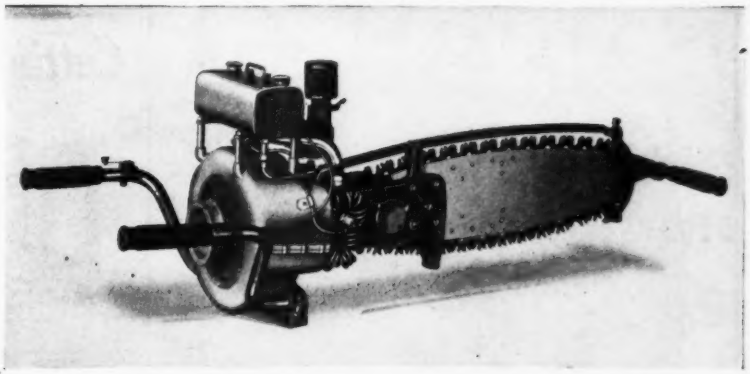
THE LUFKIN RULE CO. **SAGINAW, MICH.**
New York · Windsor, Ont.

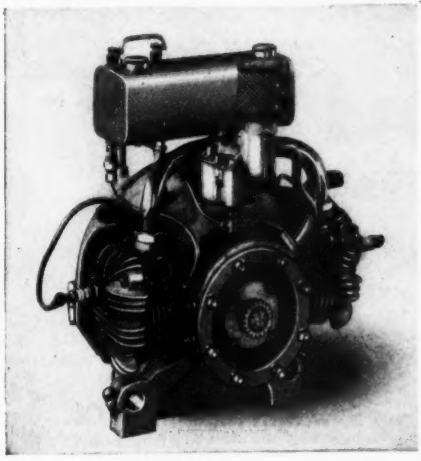
Announcing - -

the "WOLF"

Gas Engine Driven

Timber Saw





A portable self-contained unit especially designed to meet the requirements of mechanical timber cutting.

Companion to over 500 electric and air driven Wolf Saws now serving the railroad, mining, marine, general construction and other fields.

Saw frame, chain and drive units interchangeable with electric and air driven machines.

Construction of frame readily provides for horizontal and vertical cutting.

Capacities 16" and 24", weights complete 70 and 73 pounds respectively.

Engine of latest aircraft practice in design and materials, two cylinder, horizontal opposed, four cycle, air cooled type, developing eight horsepower at 3600 R. P. M., weight 45 pounds.

Inquiries solicited on engine separately for portable units where weight is important factor.

Send for descriptive circulars on saw and engine.

REED-PRENTICE CORPORATION

Worcester, Mass., U. S. A.

Offices: Detroit, Mich., New York City Agents in principal cities

Protecting Water Service Equipment

NO-OX-ID is perfectly adapted to protection of water service equipment and is used by many engineering departments in this service.

Water Treating Plants

The average treating plant is short-lived because of rust. Inspections show many plants heavily coated with rust, and scales of rust dropping off.

This condition of rapid deterioration is entirely unnecessary, because where NO-OX-ID is used, there is no rust; pumps, proportioners, mixers, piping, valves and appurtenances as well as the interior and exterior of water tanks do not deteriorate. They are clean and their life unlimited. Here is the remedy. Are YOUR treating plants in need of NO-OX-ID treatment?

Dearborn chemists engaged in testing various covering materials in prepared soil of extremely corrosive nature.

Buried Water Lines

Thousands of miles of buried petroleum and gas lines are protected with NO-OX-ID. When companies with such large investments in pipe line use it, what better endorsement is possible for the use of NO-OX-ID on water lines?

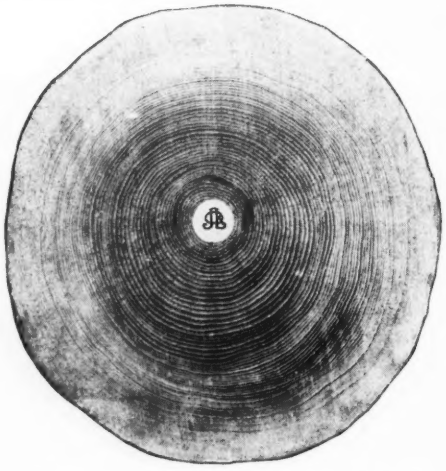
The A. R. E. A. Proceedings, Vol. 30, page 153, speaks most favorably regarding material of a petroleum base carrying rust inhibitors (which NO-OX-ID is). Its application is easier and unit cost less than other material while the increased life in years makes NO-OX-ID the most economical investment.

Suitable fabric coverings are supplied to meet all variations of climate and soil including soil stresses. In this work Dearborn Service men are ready to advise and assist in every detail. Inquiries invited.

NO-OX-ID IRON-RUST The Original Rust Preventive

Address us at 310 South Michigan Avenue, Chicago, 205 E. 42nd Street, New York, or 2454 Dundas Street, West, Toronto.

DEARBORN CHEMICAL COMPANY



Cross Section, 12" in diameter, typical of Jackson Lumber Company's Dense Long Leaf Yellow Pine

THIS SHOWS WHY DIXIE POLES LAST!

Cut from Dense Growth Long Leaf Yellow Pine, on our own lands, Dixie Poles embody the extreme durability inherent in this type of timber growth.

More than this positive factor of density at the heart, treatment penetration of sap wood is one hundred per cent.

SPECIFY DIXIE stock when ordering TREATED Poles from your dealer.

DIXIE stock is available to all TREATING PLANTS, and can be furnished economically by most plants east of the Mississippi River.

JACKSON LUMBER COMPANY POLES PILING LOCKHART ALABAMA

TRADE MARK

Selling Agent
GEORGE G. LEAVETTE
Room 416, 25 Broadway, New York City

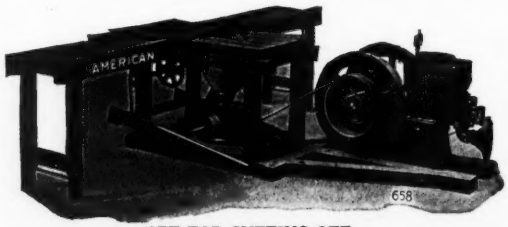
JACKSON LUMBER CO.

Manufacturers

Lockhart, Alabama

A CROSSETT WATZEK GATES INDUSTRY

Cutting Construction Costs



SET FOR CUTTING OFF

A handy, Portable Rip and Cut-off Machine—20-inch saw, handles stock up to 6 inches thick and 16 inches wide. Nothing better for hurry-up construction jobs. Furnished with or without power. Ask for Bulletin No. 82 of Portable Woodworking Machinery.

SET FOR RIPPING

American Saw Mill Machinery Co.
164 Main Street Hackettstown, N. J.

The thinking man never disregards the practical value of reading such books as "Roadway and Track." This book covers in a sentence facts that theorizing would stretch to a page.

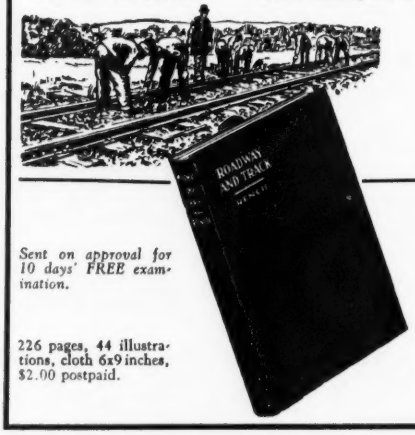
This condensation has permitted the author to do what few have done previously—make the least demand upon the reader's time in giving him the meat of modern maintenance practice.

Your best bet is "Roadway and Track" if you want facts you can apply to your own work.

You may keep this book for 10 days without cost. Order today.

Simmons-Boardman Publishing Co.
"The House of Transportation"
30 Church Street New York, N. Y.

Your Best Bet



Sent on approval for 10 days' FREE examination.

226 pages, 44 illustrations, cloth 6x9 inches, $2.00 postpaid.

Winter King Switch Heaters

Keep switches clear and reduce cost of snow removal

THE Winter King Switch Heater keeps switch points free from ice and snow, andswitches open in the worst conditions of winter weather. Substantial savings in snow removal costs are to be had by the use of Winter King Switch Heaters. Where these heaters are installed, the cost of snow removal is about one-third of that with the hand method. One man can take care of about 100 heaters, thereby considerably reducing, or eliminating entirely, extra labor.

The Winter King Switch Heater is shipped with the wick installed, ready for immediate use. It is necessary only to place the heater beneath the switch point, fill with kerosene, and light the wick.

BETHLEHEM STEEL COMPANY

General Offices: Bethlehem, Pa.

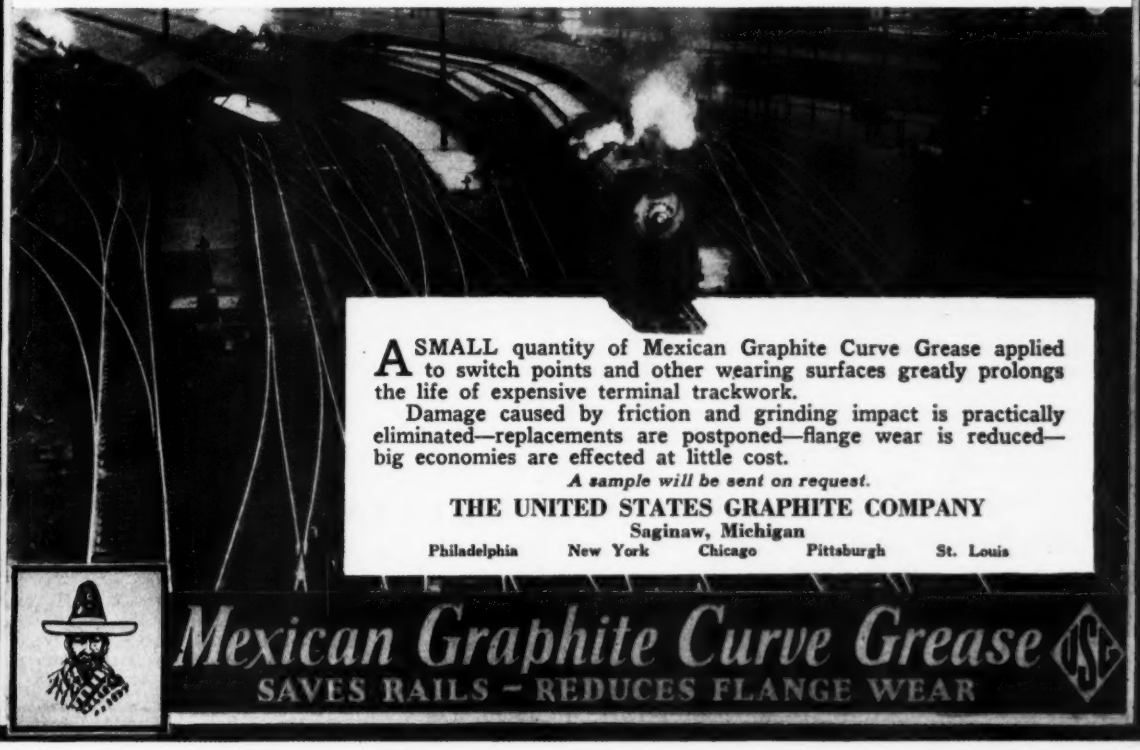
District Offices: New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Pittsburgh, Cleveland, Detroit, Cincinnati, Chicago, St. Louis.

Pacific Coast Distributor: Pacific Coast Steel Corporation, San Francisco, Portland, Los Angeles, Seattle, Honolulu.

Export Distributor: Bethlehem Steel Export Corporation, 25 Broadway, New York City.

BETHLEHEM

LUBRICATE YOUR SWITCH POINTS



A SMALL quantity of Mexican Graphite Curve Grease applied to switch points and other wearing surfaces greatly prolongs the life of expensive terminal trackwork.

Damage caused by friction and grinding impact is practically eliminated—replacements are postponed—flange wear is reduced—big economies are effected at little cost.

A sample will be sent on request.

THE UNITED STATES GRAPHITE COMPANY

Saginaw, Michigan

Philadelphia New York Chicago Pittsburgh St. Louis

Mexican Graphite Curve Grease USG

SAVES RAILS – REDUCES FLANGE WEAR

ALPHABETICAL INDEX TO ADVERTISERS

A

American Saw Mill Machinery Co. 68
Armco Culvert Mfrs. Assn. 7

B

Baldwin-Southwark Corp. 65
Bethlehem Steel Co. 69
Buckeye Tranction Ditcher Co. 70
Bucyrus-Erie Co. 9
Butler Mfg. Co. 12

C

Calcyanide Co. 70
Caterpillar Tractor Co. 61
Chipman Chemical Eng. Co., Inc. 13

D

Dearborn Chemical Co. 67

G

Gohi Culvert Mfrs., Inc. 17

J

Jackson Lumber Co. 68

L

Louisville Frog, Switch & Signal Co. 66
Lufkin Rule Co. 66
Lundie Engineering Corp. 3

M

Massey Concrete Products Corp. 14
Mechanical Mfg. Co. 64

N

National Lock Washer Co. 71
Nordberg Mfg. Co. 6

O

Oxweld Railroad Service Corp. 15

P

P & M Co. 1

R

Rail Joint Co. 63
Railway Trackwork Co. 2
Ramapo Ajax Corp. 19-20-21-22
Reading Iron Co. 5
Reed-Prentice Corp. 67

S

Simmons-Boardman Publishing Co. 66-68
Southern Wood Preserving Co. 64
Southwark Foundry & Machine Co. Div. 65
Syntron Co. 11

T

Timken Roller Bearing Co. 72

U

U. S. Graphite Co. 69

W

Western Wheeled Scraper Co. 10
Woodings Forge & Tool Co. 59
Woodings-Verona Tool Works 8
Worthington Pump & Machinery Co. 4

Buckeye's 3/8-Yard Shovel-Crane

***for* Great Utility at Low Cost**

EXTREMELY wide working range coupled with low original and upkeep costs make compact, rugged 3/8-yard Buckeye highly profitable for miscellaneous railway engineering and maintenance operations. It is full revolving and readily convertible to Shovel, Crane, Clamshell, Dragline and Backfiller service as desired.

Alligator Crawlers adapt this Utility Buckeye to duty independent of rails. *Flanged Wheels* fit it for service on main track or from rails laid on flat cars. Would you like specifications and its price?

The Buckeye Traction Ditcher Co.
Findlay, Ohio

Railway Sales Representatives:
THE HOPKINS COMPANY
CHICAGO Marquette Building
CLEVELAND 241 Euclid Avenue

Bugs In Your Cars?

Bedbugs, fleas and lice are the most common insects which infest bunk cars and other railroad facilities.

Railroad Calcyanide is the favorite of a great many railroad men *because one application destroys all insects in the car —including the eggs!*

Railroad Calcyanide is marketed in 2-lb. and 3-lb. sprinkler-top cans.

Write for a copy of our illustrated booklet containing directions for use

CALCYANIDE COMPANY
60 E. 42nd St., New York City

Distributors: CHICAGO, Smithereen Co., 130 N. Wells St.; HARTFORD, The Birchard System, Inc., 312 Church St.; KANSAS CITY, W. W. Hinds, 4013 Madison Ave.; SAN FRANCISCO, John F. Leinen Sanitation Co., 1337 Mission St.

THE BEST IS CHEAPEST IN THE END » » » .

By the keg or carload Improved Hipowers cost more. But by years of service they cost far less. Railroad after railroad pays a slightly higher first cost knowing that the ultimate cost is less. This is no time to overlook economies.

THE NATIONAL LOCK WASHER COMPANY
Newark, New Jersey, U. S. A.

IMPROVED
HIPOWER

The High Pressure Spring Washer. Ultimately costs less. Flexibility essential to expansion and contraction of rail. A non-flattenable spring in heaviest service—never an inert flat filler. Ask those experienced in track maintenance—they know.

A suggestion to railroad maintenance men—how to reduce maintenance costs in 1932

With business on the up grade, railroads will probably be called upon to handle a greater volume of traffic this year. Maintenance costs will assume correspondingly greater importance.

With that in mind, maintenance equipment of every type should be scrutinized closely for evidences of waste.

Equipment that is costing too much for power, fuel, lubricant or upkeep has no place in today's maintenance programs. It will pay you to discard it in favor of more efficient and more economical machinery —Timken Bearing Equipped.

In leading makes of section motor cars and trailers, discers, power shovels, conveyors, hoists, air compressors, cranes and other types of maintenance equipment, Timken Bearings slash operating costs, increase dependability and lengthen machine life.

Vital rotating parts are freed from the drag and wear of friction. Gears and shafts are held in alignment and protected against radial, thrust and combined loads by Timken tapered construction, Timken positively aligned rolls and Timken-made steel. Extra years of service are the rule.

It is false economy to try to get along with obsolescent maintenance equipment. You'll pay much more in the long run than new machinery will cost you now. Specify Timken-equipped. The Timken Roller Bearing Company, Canton, Ohio.

TIMKEN *Tapered Roller* **BEARINGS**